FCC CFR47 PART 15 SUBPART C

INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

3x3 MIMO BASE STATION

MODEL NUMBER: A1470

FCC ID: BCGA1470
IC: 579C-A1470

REPORT NUMBER: 12U14745-1, Revision A

ISSUE DATE: MAY 23, 2013

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Revision History

Rev.	Issue Date	Revisions	Revised By
--	03/29/13	Initial Issue	F. Ibrahim
A	05/23/13	Added output power sections for HT20 BF 2TX and 3TX in the 2.4 GHz band. Added output power sections for VHT80 BF 2TX and VHT80 BF 3TX in the 5.8 GHz band. Revised 8.1 and 8.2	F. Ibrahim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE, INC.
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EUT DESCRIPTION: 3x3 MIMO BASE STATION

MODEL: A1470

SERIAL NUMBER: C86K500PFGCP, C86K5029FGCP

DATE TESTED: Dec 10, 2012 – Mar 26, 2013

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL CCS tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

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UL CCS

Tested By:

TOM CHEN
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2003, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11a/b/g/n/ac 3X3 MIMO Base Station. Transmit beam forming is supported on 802.11n/ac.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

2400 - 2483.5 MHz Authorized Frequency Band						
Frequency Range (MHz)	Mode	Avg Power, Chain 0 (dBm)	Avg Power, Chain 1 (dBm)	Avg Power, Chain 2 (dBm)	Total Avg power (dBm)	Total Avg power (mW)
2412 - 2462	802.11b Legacy 1TX	N/A	24.00	N/A	24.00	251.19
2412 - 2462	802.11b CDD 2TX	21.90	22.20	N/A	25.06	320.63
2412 - 2462	802.11b CDD 3TX	20.99	21.45	21.21	25.99	397.19
2412 - 2462	802.11g Legacy 1TX	N/A	23	N/A	23.00	199.53
2412 - 2462	802.11n HT20 2TX	23.20	23.00	N/A	26.11	408.32
2412 - 2462	802.11n HT20 3TX	21.90	22.50	22.30	27.01	502.34
5725 - 5850 MHz Authorized Frequency Band						
Frequency Range (MHz)	Mode	Avg Power, Chain 0 (dBm)	Avg Power, Chain 1 (dBm)	Avg Power, Chain 2 (dBm)	Total Avg power (dBm)	Total Avg power (mW)
5745 - 5825	802.11n HT20 3TX	24.80	25.20	24.90	29.74	941.89
5745 - 5825	802.11n HT20 BF 2TX	24.80	25.20	N/A	28.01	632.41
5745 - 5825	802.11n HT20 BF 3TX	22.15	22.70	22.30	27.16	520.00
5755 - 5795	802.11n HT40 3TX	24.30	24.50	24.40	29.17	826.04
5755 - 5795	802.11n HT40 BF 2TX	24.30	24.60	N/A	27.46	557.19
5755 - 5795	802.11n HT40 BF 3TX	22.10	22.50	22.30	27.07	509.33
5775	802.11ac VHT80 3TX	21.00	21.30	21.10	25.91	389.94

Modes covering other modes in the 2.4 GHz band

- 2412-2462: 802.11HT20 1TX: Covered by worst case 802.11g Legacy 1TX testing
- 2412-2462: 802.11HT20 BF 2TX: Covered by worst case 802.11n HT20 2TX testing
- 2412-2462: 802.11AC20 2TX: Covered by worst case 802.11n HT20 2TX testing
- 2412-2462: 802.11AC20 BF 2TX: Covered by worst case 802.11n HT20 2TX testing
- 2412-2462: 802.11HT20 BF 3TX: Covered by worst case 802.11n HT20 3TX testing
- 2412-2462: 802.11AC20 3TX: Covered by worst case 802.11n HT20 3TX testing
- 2412-2462: 802.11AC20 BF 3TX: Covered by worst case 802.11n HT20 3TX testing

Modes covering other modes in the 5 GHz bands

5745-5825: 802.11a Legacy 1TX: Covered by worst case 802.11n HT20 CDD 3TX Mode testing
5745-5825: 802.11a CDD 2TX: Covered by worst case 802.11n HT20 CDD 3TX Mode testing
5745-5825: 802.11a CDD 3TX: Covered by worst case 802.11n HT20 CDD 3TX Mode testing
5745-5825: 802.11HT20 1TX: Covered by worst case 802.11n HT20 CDD 3TX Mode testing
5745-5825: 802.11HT20 2TX: Covered by worst case 802.11n HT20 CDD 3TX Mode testing
5745-5825: 802.11AC20 2TX: Covered by worst case 802.11n HT20 CDD 3TX Mode testing
5745-5825: 802.11AC20 3TX: Covered by worst case 802.11n HT20 CDD 3TX Mode testing
5745-5825: 802.11AC20 BF 2TX: Covered by worst case 802.11n HT20 BF 2TX Mode testing
5745-5825: 802.11AC20 BF 3TX: Covered by worst case 802.11n HT20 BF 3TX Mode testing
5755-5795: 802.11HT40 1TX: Covered by worst case 802.11n HT40 CDD 3TX Mode testing
5755-5795: 802.11HT40 2TX: Covered by worst case 802.11n HT40 CDD 3TX Mode testing
5755-5795: 802.11AC40 2TX: Covered by worst case 802.11n HT40 CDD 3TX Mode testing
5755-5795: 802.11AC40 3TX: Covered by worst case 802.11n HT40 CDD 3TX Mode testing
5755-5795: 802.11AC40 BF 2TX: Covered by worst case 802.11n HT40 BF 2TX Mode testing
5755-5795: 802.11AC40 BF 3TX: Covered by worst case 802.11n HT40 BF 3TX Mode testing
5775: 802.11ac VHT80 1TX: Covered by worst case 802.11ac VHT80 3TX Mode testing
5775: 802.11ac VHT80 2TX: Covered by worst case 802.11ac VHT80 3TX Mode testing
5775: 802.11ac VHT80 BF 2TX: Covered by worst case 802.11ac VHT80 3TX Mode testing
5775: 802.11ac VHT80 BF 3TX: Covered by worst case 802.11ac VHT80 3TX Mode testing

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Band (GHz)	Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
2.4	3.00	3.00	3.10	3.03
5.2	3.20	1.40	2.20	2.33
5.3	3.40	1.60	2.30	2.50
5.6	3.00	1.70	3.80	2.92
5.8	2.70	1.90	4.40	3.13

Band (GHz)	Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
2.4	3.00	3.00	3.10	7.80
5.2	3.20	1.40	2.20	7.07
5.3	3.40	1.60	2.30	7.24
5.6	3.00	1.70	3.80	7.65
5.8	2.70	1.90	4.40	7.83

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 6.10.56.166.

5.5. WORST-CASE CONFIGURATION AND MODE

The fundamental emission of the EUT was investigated in three orthogonal orientations; X,Y and Z. It was determined that Y orientation is worst-case; therefore, all final radiated emissions testing was performed with the EUT in Y orientation.

The EUT was a 3x3 MIMO Base Station connected to a host Laptop PC.

Worst-Case data rates, as provided by the client, were as follows:

For 2.4 GHz Band:
802.11b: 1 Mb/s.
802.11g: 6 Mb/s.
802.11n 20MHz: MCS0.

For 5.8 GHz Band:
802.11a: 6 Mb/s.
802.11n 20MHz: MCS0.
802.11n 40MHz: MCS0.
802.11ac VHT80: MCS0.

Worst-case mode and channel used for 30-1000 MHz radiated and power line conducted emissions was the mode and channel with the highest output power.

Radiated Band Edge measurement has been performed on additional channels CH2 to CH4 and CH8 to CH10 and has been verified to meet the requirements.

For the modes where CH2, CH3 and CH9, CH10 were tested for output power, all other test items at CH1 and CH11 were performed with the higher power level among CH1, CH2 and CH3 and among CH9, CH10 and CH11 as worst-case scenario.

For all modes with single chain, chain 1 was selected per the software provided by the client. Based on the client a preliminary investigation was performed on the three chains and chain 1 was found to be worst-case.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop PC	Apple	MacBook M42A	PT358811	DoC
Direct Plug-In AC-DC Adapter	Apple	PA-1850	N/A	N/A
Mouse	HP	MOE2UO	CNP10300BB	DoC

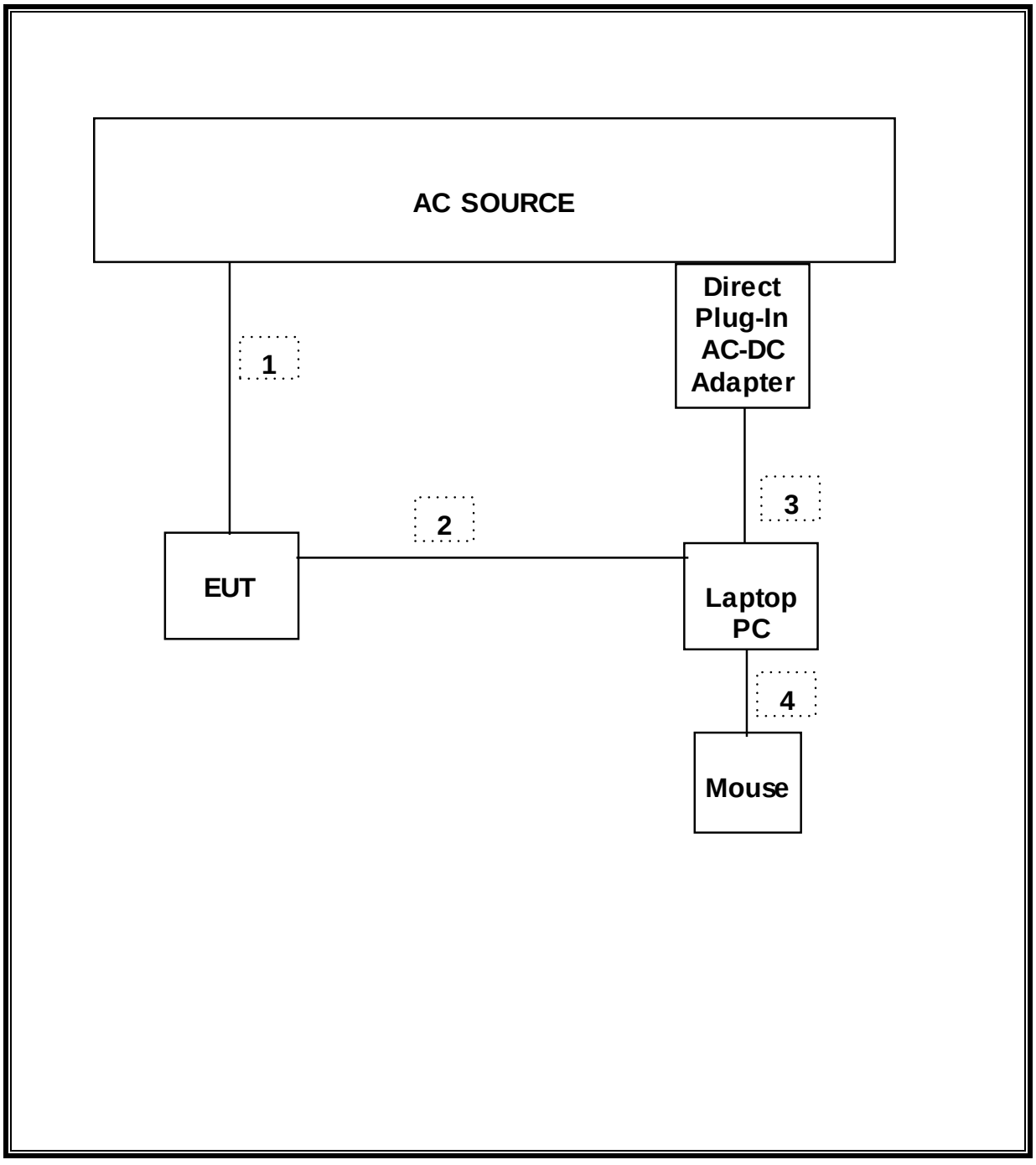
I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	1	2P	Non-shielded	1.8	
2	Ethernet	1	Ethernet	Non-shielded	3	
3	DC	1	DC	Non-shielded	1.75	
4	USB	1	USB	Non-shielded	0.6	

TEST SETUP

The EUT is powered by AC source only during test. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List					
Description	**Manufacturer**	**Model**	**Asset**	**Cal Date**	**Cal Due**
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01179	02/16/12	02/26/14
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	10/21/12	10/21/13
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI 7	1000741	08/08/12	08/08/13
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI 7	N/A	08/21/12	08/21/13
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/08/12	08/08/13
Antenna, Horn, 18 GHz	EMCO	3115	C00945	11/12/12	11/12/13
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	11/14/12	11/14/13
Antenna, Horn, 40 GHz	ARA	MWH-2640/B	C00981	06/14/11	06/14/13
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	N/A	02/07/12	03/06/14
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	10/19/12	10/19/13
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	10/22/12	10/22/13
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	08/02/11	08/02/13
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	12/20/11	12/30/13
P-Series single channel Power Meter	Agilent / HP	N1911A	N/A	07/27/12	07/27/13
Peak / Average Power Sensor	Agilent / HP	E9323A	N/A	07/26/12	07/26/13
LISN, 30 MHz	FCC	50/250-25-2	C00626	12/13/11	01/13/14

7. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 D01 v02; Zero-Span Spectrum Analyzer Method.

7.1. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
802.11b	2.4600	2.4900	0.988	98.8%	0.00
802.11g	2.0500	2.0900	0.981	98.1%	0.00
802.11a 20 MHz	2.0550	2.0900	0.983	98.3%	0.00
802.11n HT20 CDD	1.9110	1.9500	0.980	98.0%	0.00
802.11n HT20 STBC	1.9250	1.9450	0.990	99.0%	0.00
802.11n HT40 SISO	0.9424	0.9601	0.982	98.2%	0.00
802.11n HT40 CDD	0.9449	0.9627	0.982	98.2%	0.00
802.11n HT40 STBC	0.9520	0.9707	0.981	98.1%	0.00
802.11ac VHT80 SISO	0.6000	0.6133	0.978	97.8%	0.10
802.11ac VHT80 CDD	0.5953	0.6080	0.979	97.9%	0.09
802.11ac VHT80 STBC	0.5979	0.6105	0.979	97.9%	0.09

7.2. MEASUREMENT METHODS

6 dB BW: KDB 558074 D01 v02, Section 7.0.

Output Power: KDB 558074 D01 v02, Sections 8.2.3 and 8.2.4.

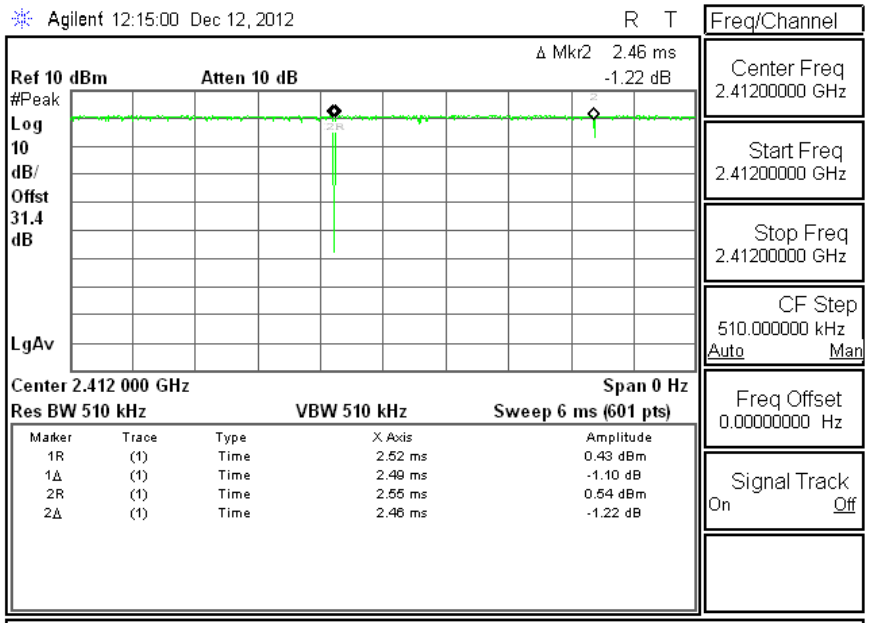
Power Spectral Density: KDB 558074 D01 v02, Sections 9.2 and 9.4.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v02, Sections 10.1.

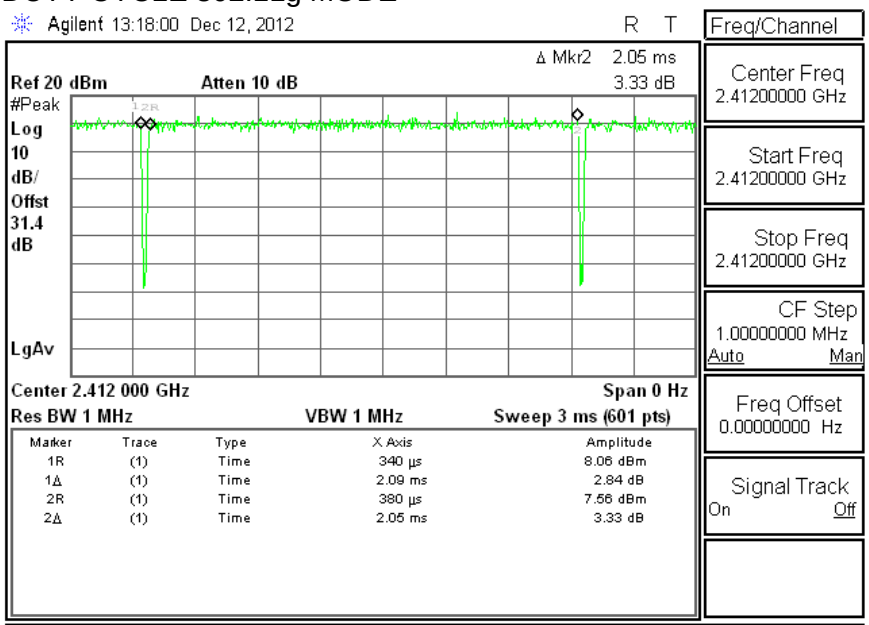
Out-of-band emissions in restricted bands: KDB 558074 D01 v02, Sections 10.2.1.

7.3. DUTY CYCLE PLOTS

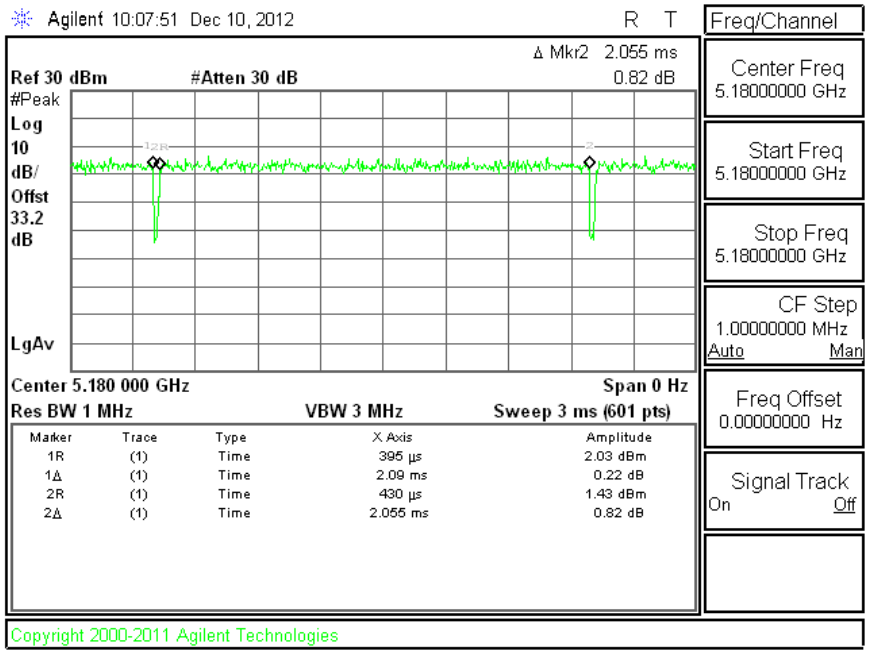
DUTY CYCLE 802.11b MODE



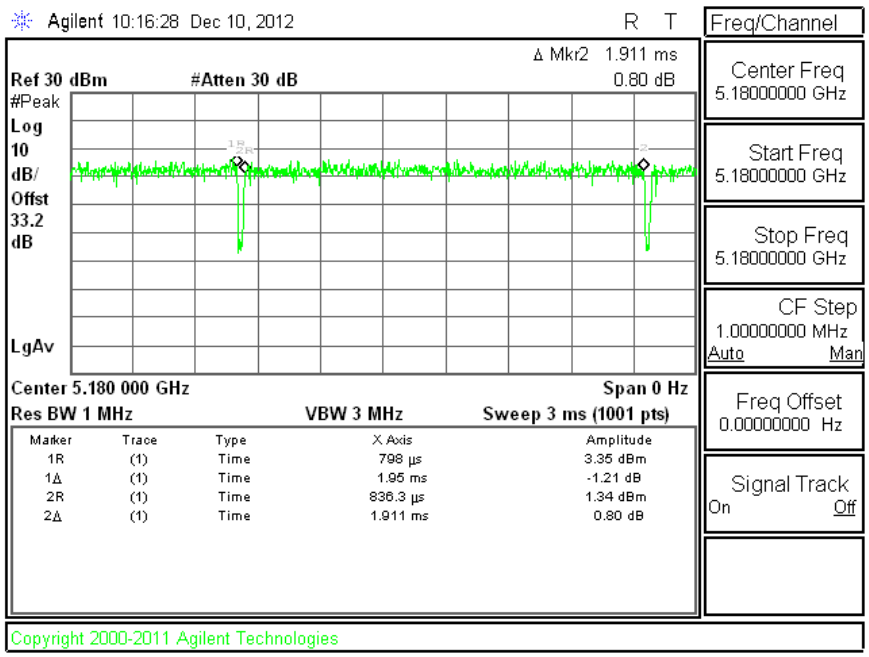
DUTY CYCLE 802.11g MODE



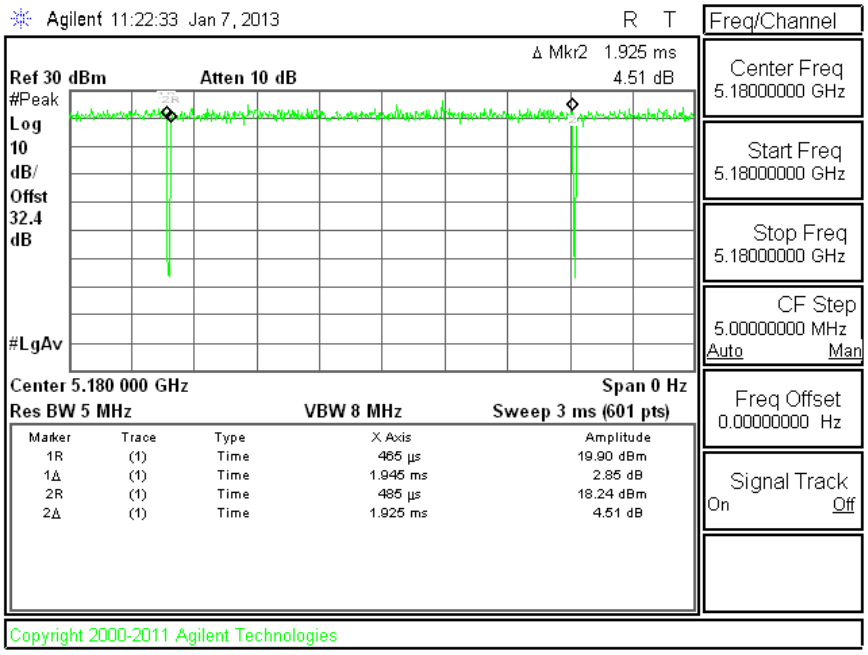
DUTY CYCLE 802.11a HT20 MODE



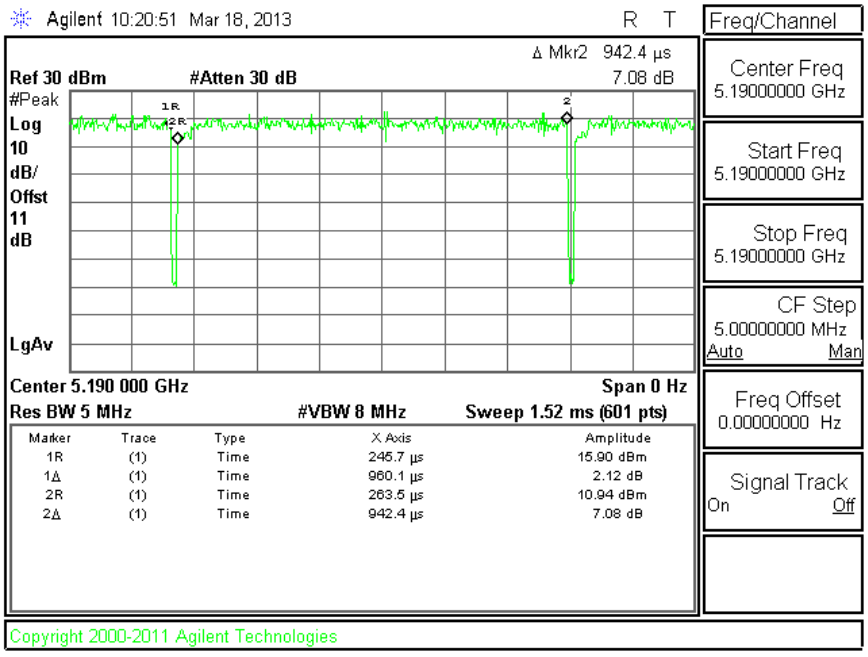
DUTY CYCLE 802.11n HT20 CDD MODE



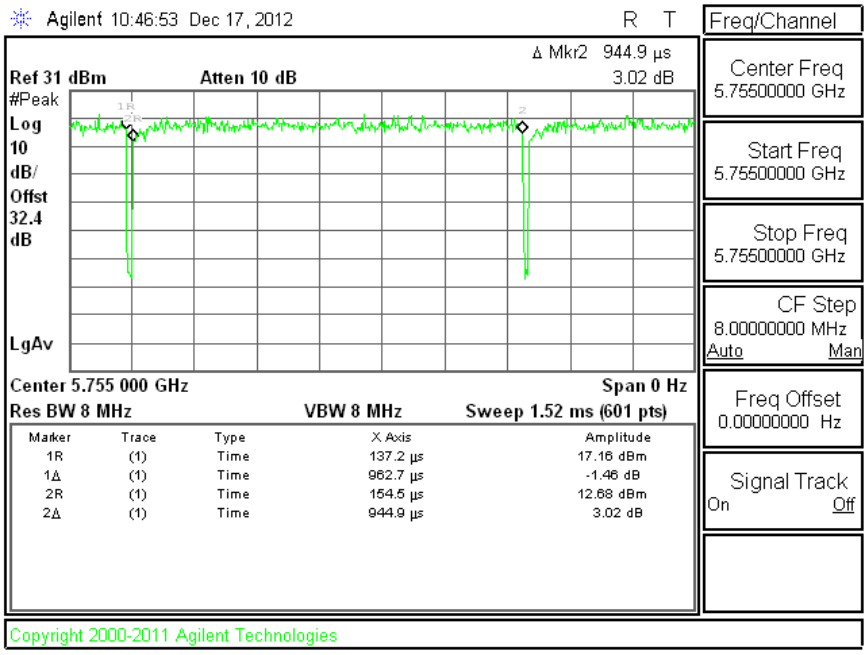
DUTY CYCLE 802.11n HT20 STBC MODE



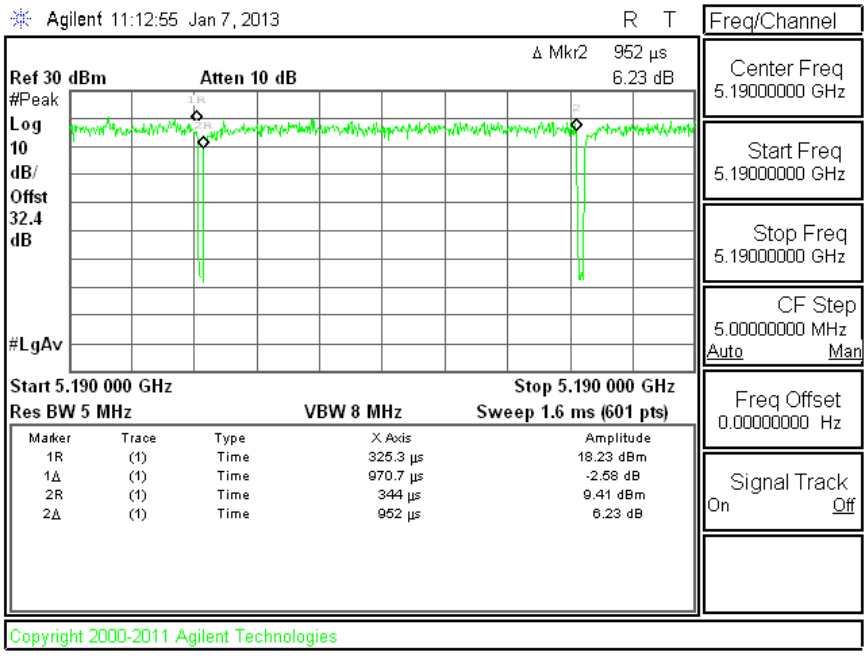
DUTY CYCLE 802.11n HT40 SISO MODE



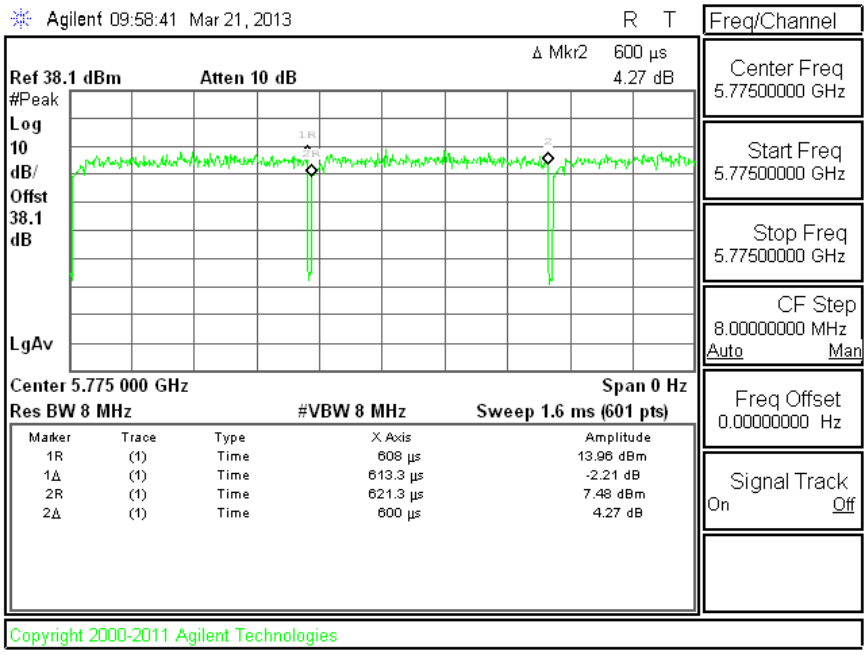
DUTY CYCLE 802.11n HT40 CDD MODE



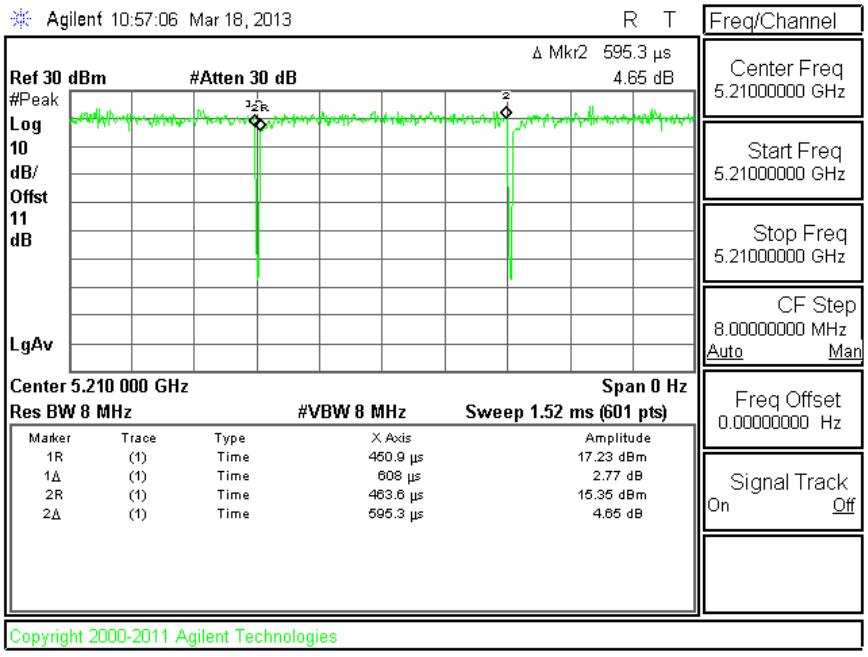
DUTY CYCLE 802.11n HT40 STBC MODE

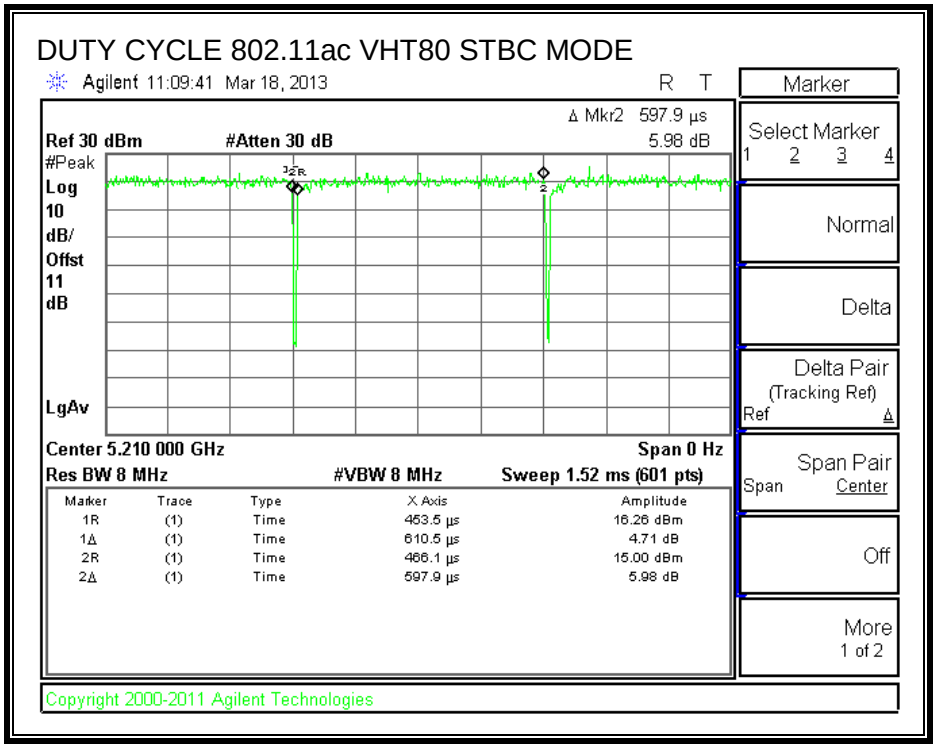


DUTY CYCLE 802.11ac VHT80 SISO MODE



DUTY CYCLE 802.11ac VHT80 CDD MODE





8. ANTENNA PORT TEST RESULTS

8.1. 802.11b 1TX MODE IN THE 2.4 GHz BAND

Covered by testing 11b CDD 3TX, power per chain used, for testing, in the 802.11b 3TX mode is equal or higher than the power per chain that will be used for 802.11b 1TX.

8.1.1. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 31.4 dB (including 30 dB pad and 1.4 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low1	2412	19.10
Low2	2417	20.50
Low3	2422	21.50
Mid	2437	24.00
High3	2452	21.50
High2	2457	20.00
High1	2462	18.50

8.2. 802.11b 2TX MODE IN THE 2.4 GHz BAND

Covered by testing 11b CDD 3TX, power per chain used, for testing, in the 802.11b 3TX mode is equal or higher than the power per chain that will be used for 802.11b 2TX.

8.2.1. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 31.4 dB (including 30 dB pad and 1.4 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low1	2412	17.50	17.70	20.61
Low2	2417	18.40	18.60	21.51
Low3	2422	19.50	19.65	22.59
Mid	2437	21.90	22.20	25.06
High3	2452	21.90	22.10	25.01
High2	2457	20.00	20.20	23.11
High1	2462	18.45	18.60	21.54

8.3. 802.11b 3TX MODE IN THE 2.4 GHz BAND

8.3.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

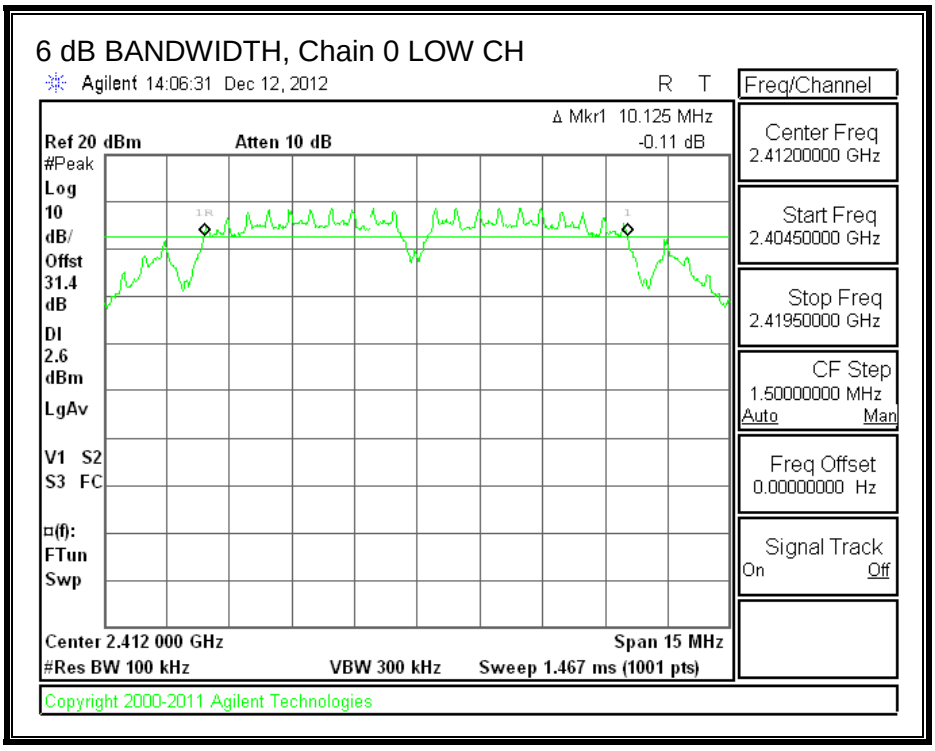
IC RSS-210 A8.2 (a)

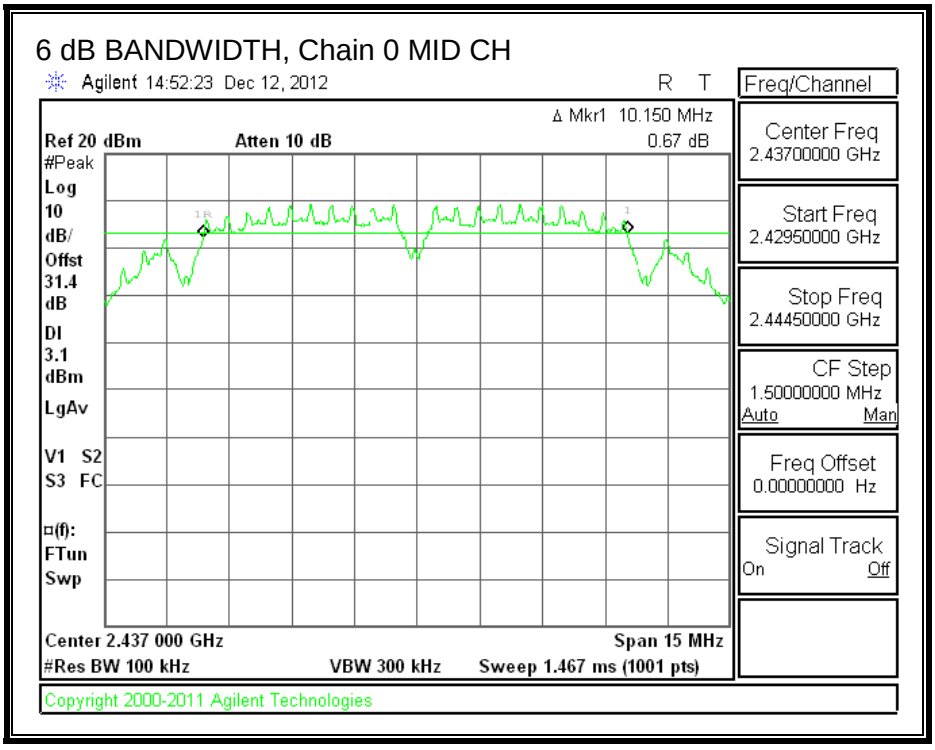
The minimum 6 dB bandwidth shall be at least 500 kHz.

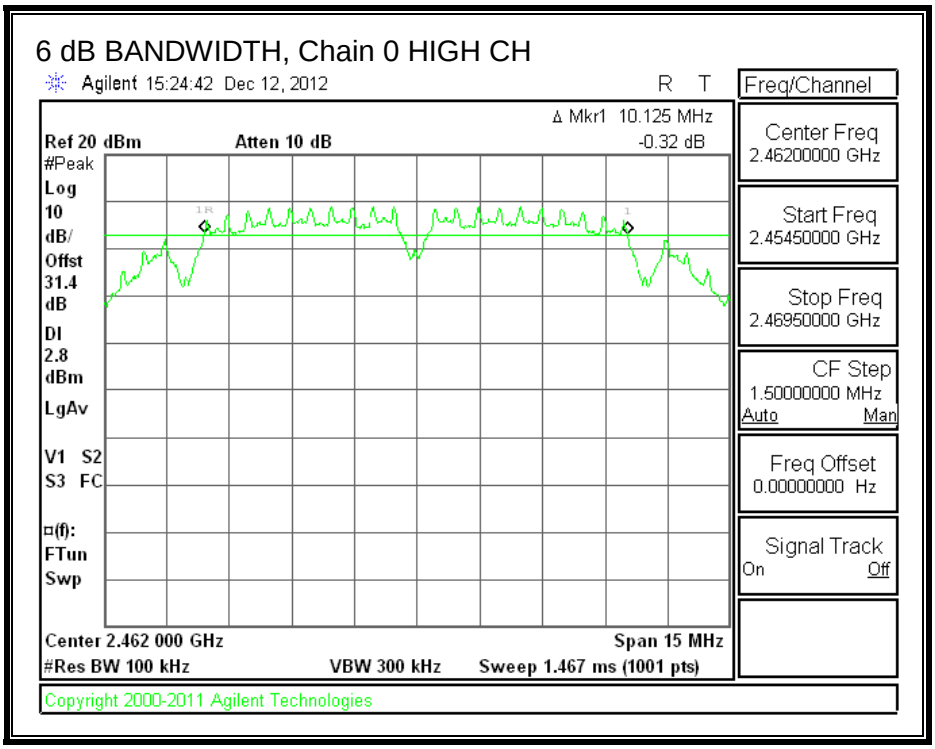
RESULTS

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	6 dB BW Chain 2 (MHz)	Minimum Limit (MHz)
Low	2412	10.125	10.150	10.150	0.5
Mid	2437	10.150	10.150	10.150	0.5
High	2462	10.125	10.125	10.150	0.5

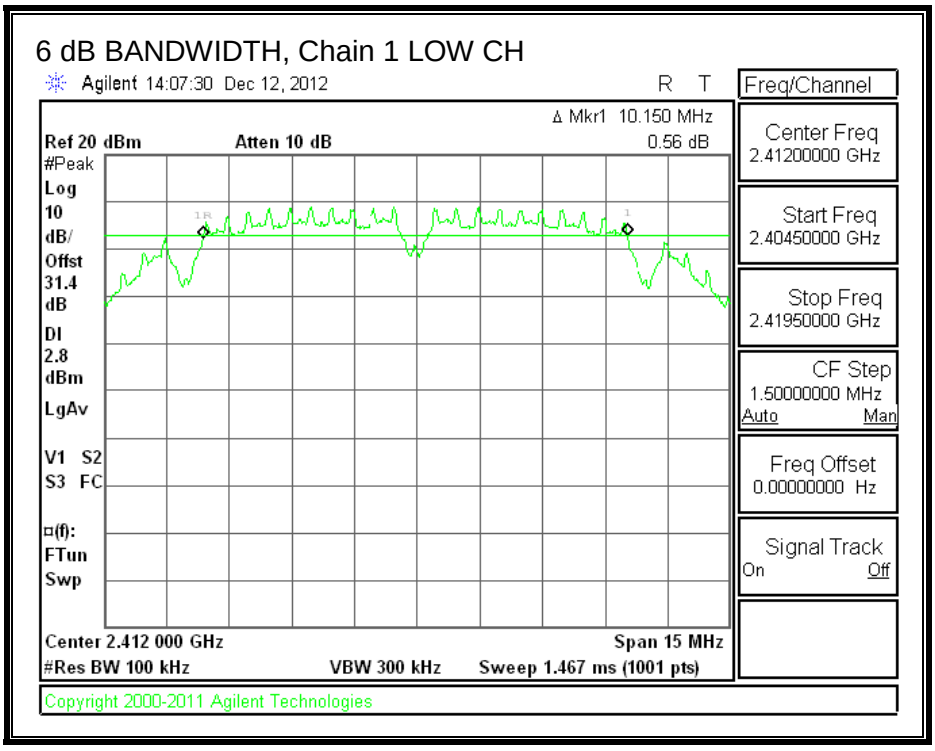
6 dB BANDWIDTH, Chain 0

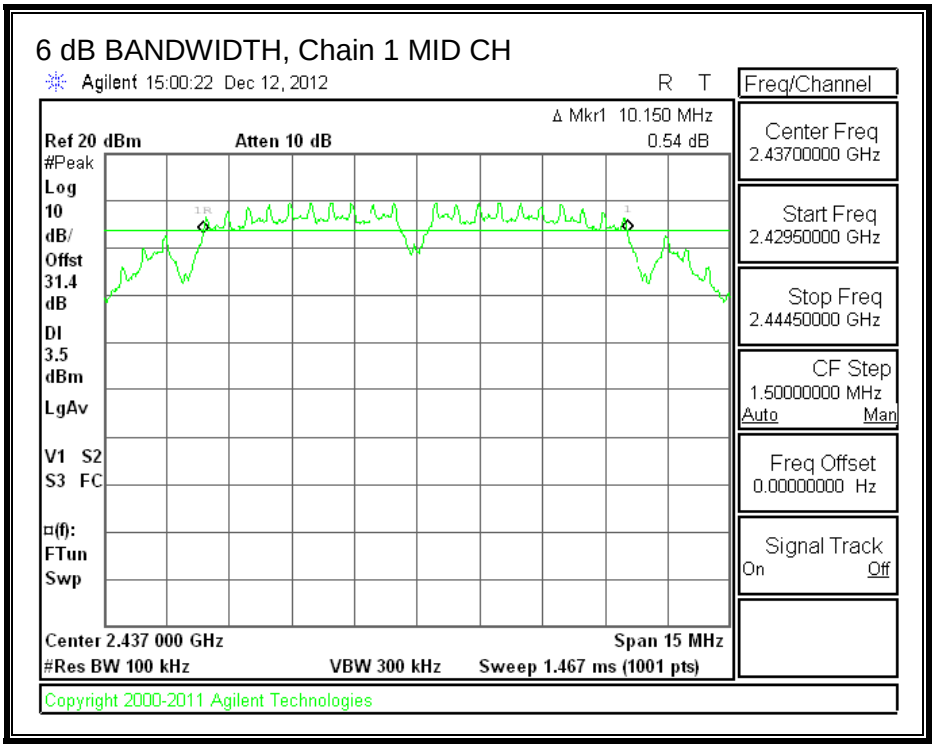


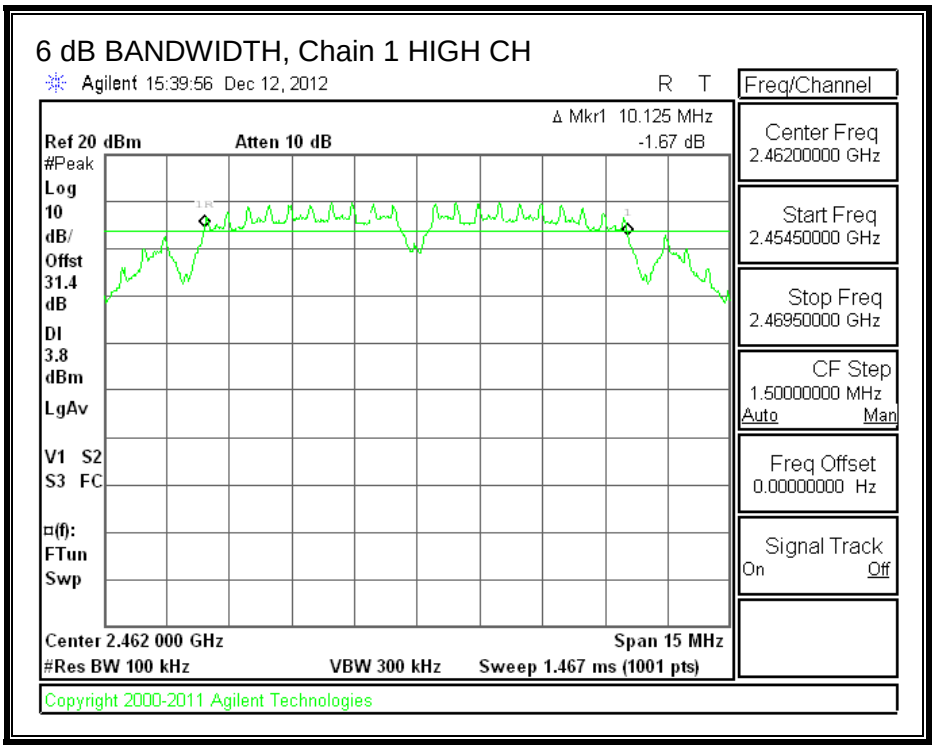




6 dB BANDWIDTH, Chain 1

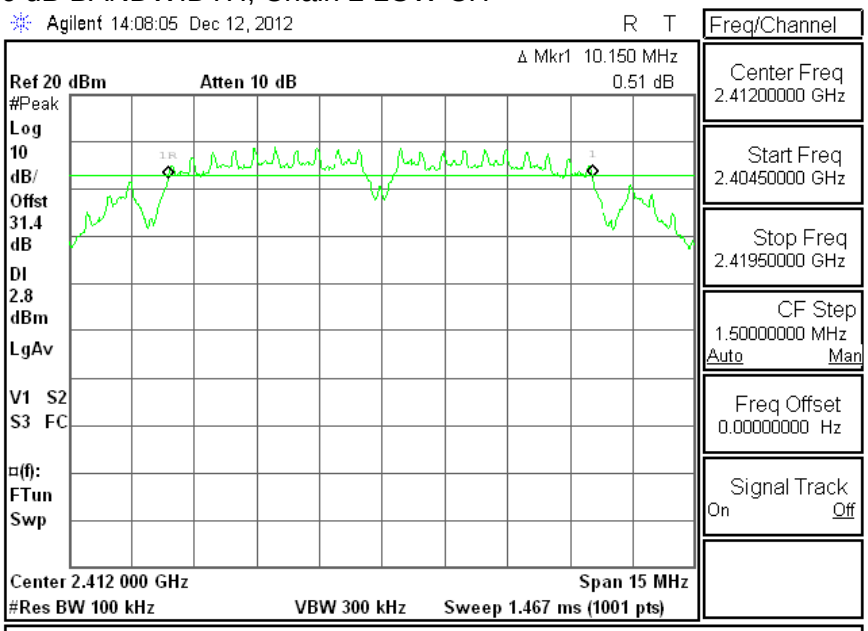




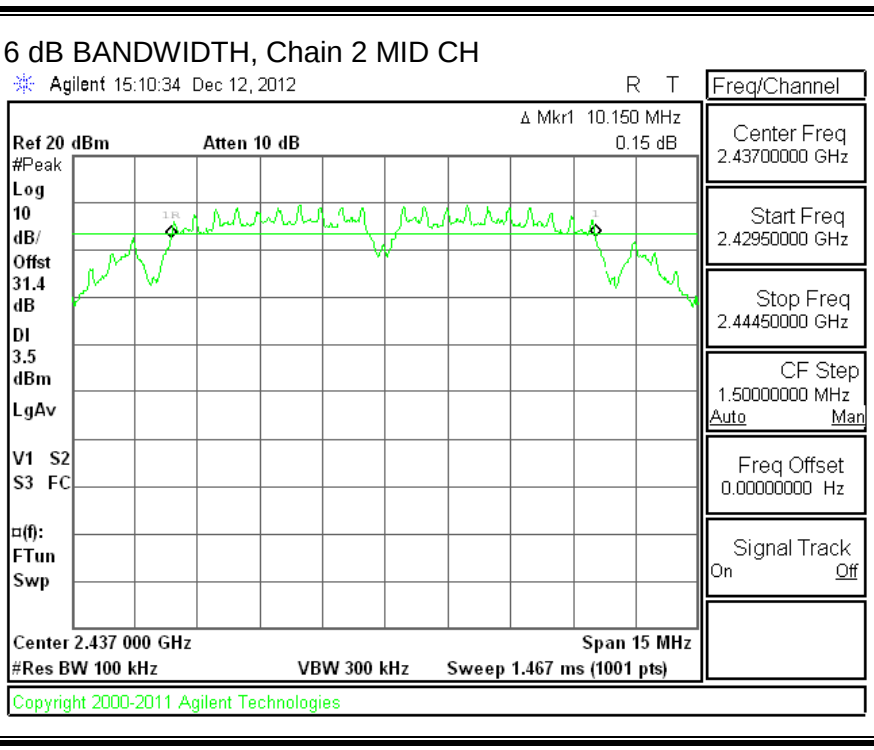


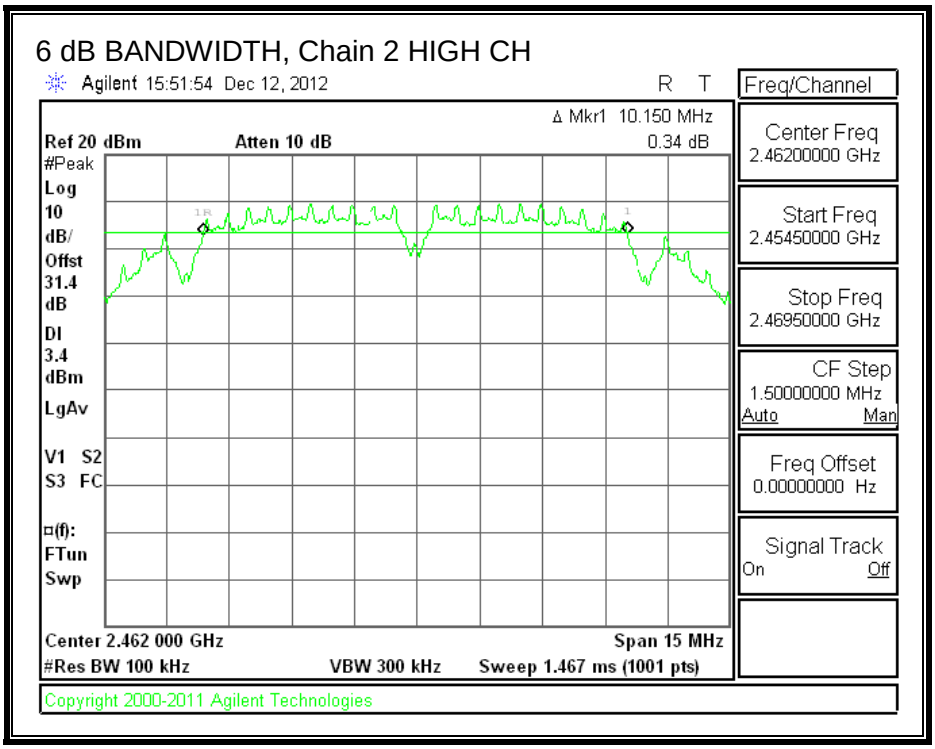
6 dB BANDWIDTH, Chain 2

6 dB BANDWIDTH, Chain 2 LOW CH



6 dB BANDWIDTH, Chain 2 MID CH





8.3.2. 99% BANDWIDTH

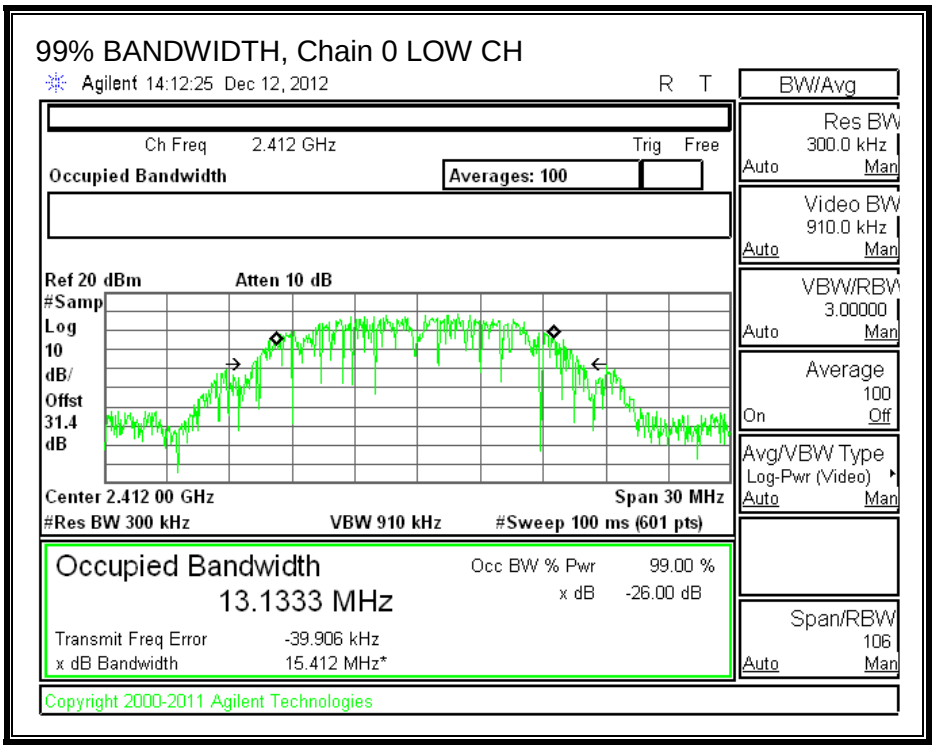
LIMITS

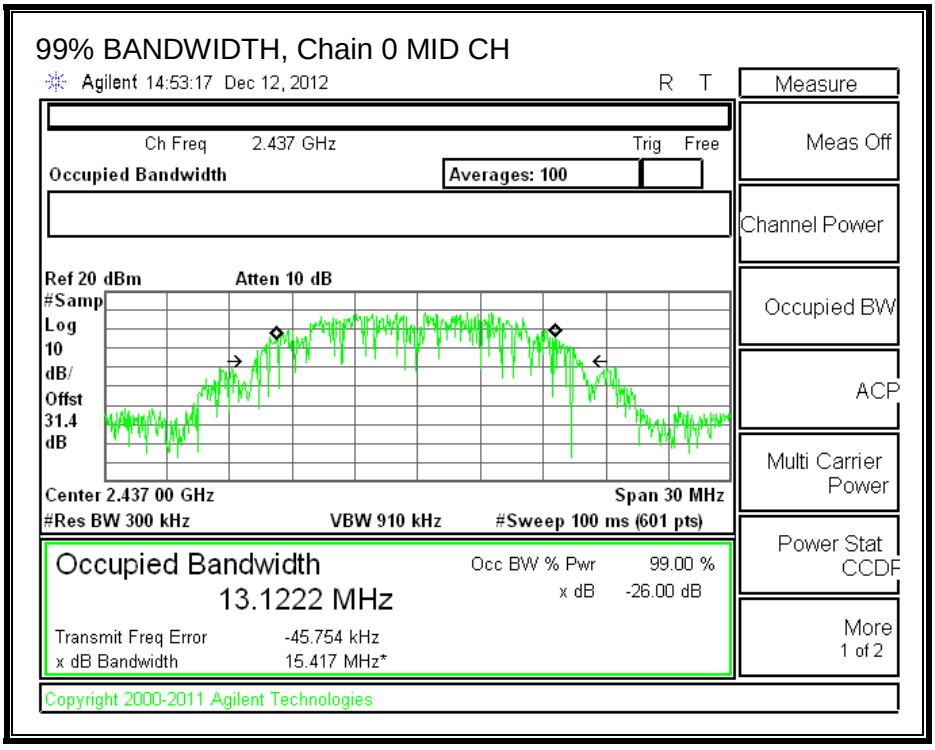
None; for reporting purposes only.

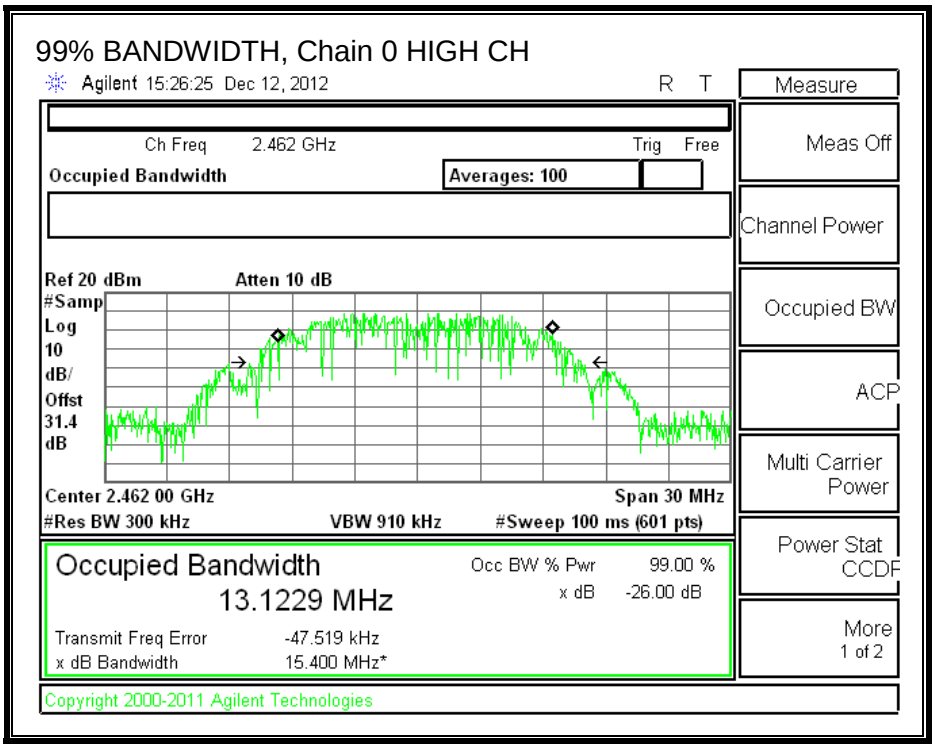
RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Low	2412	13.1333	13.1136	13.1438
Mid	2437	13.1222	13.1106	13.1364
High	2462	13.1229	13.1107	13.1522

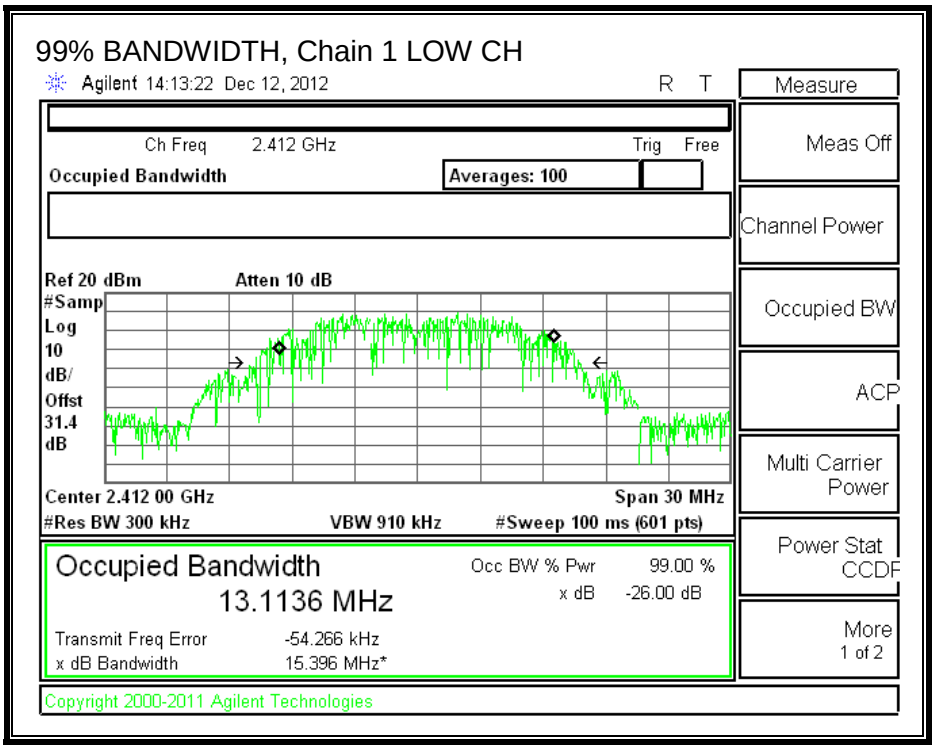
99% BANDWIDTH, Chain 0

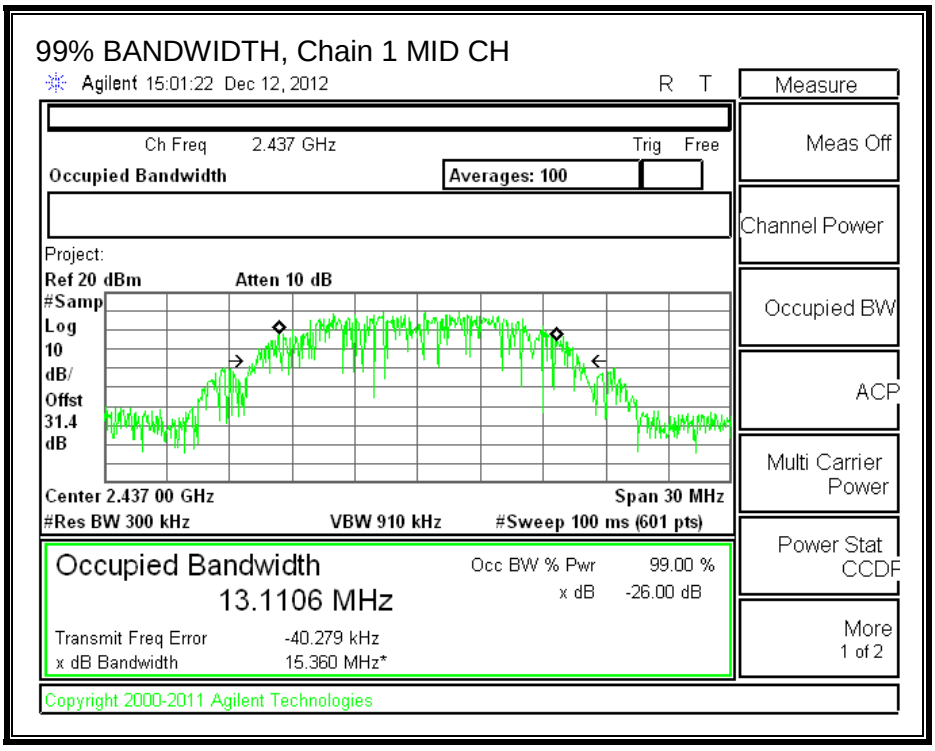


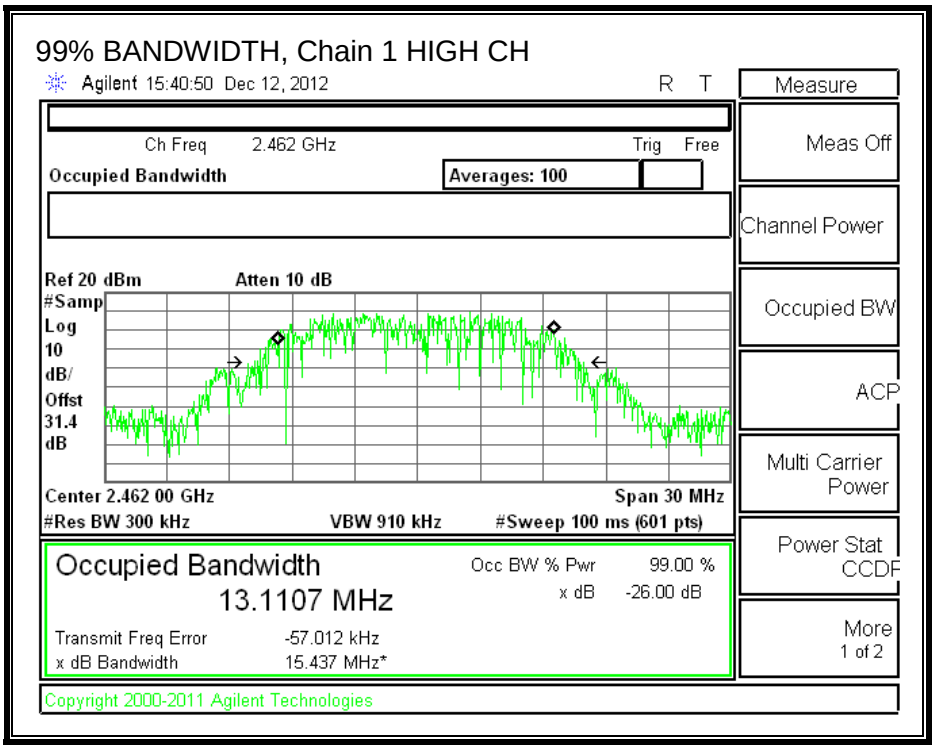




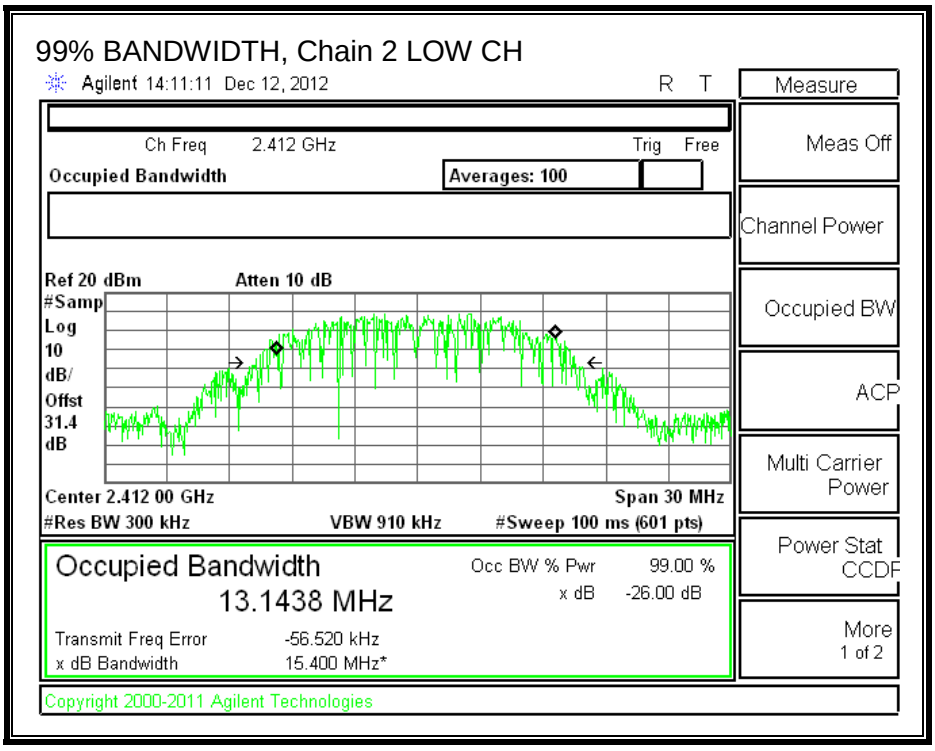
99% BANDWIDTH, Chain 1

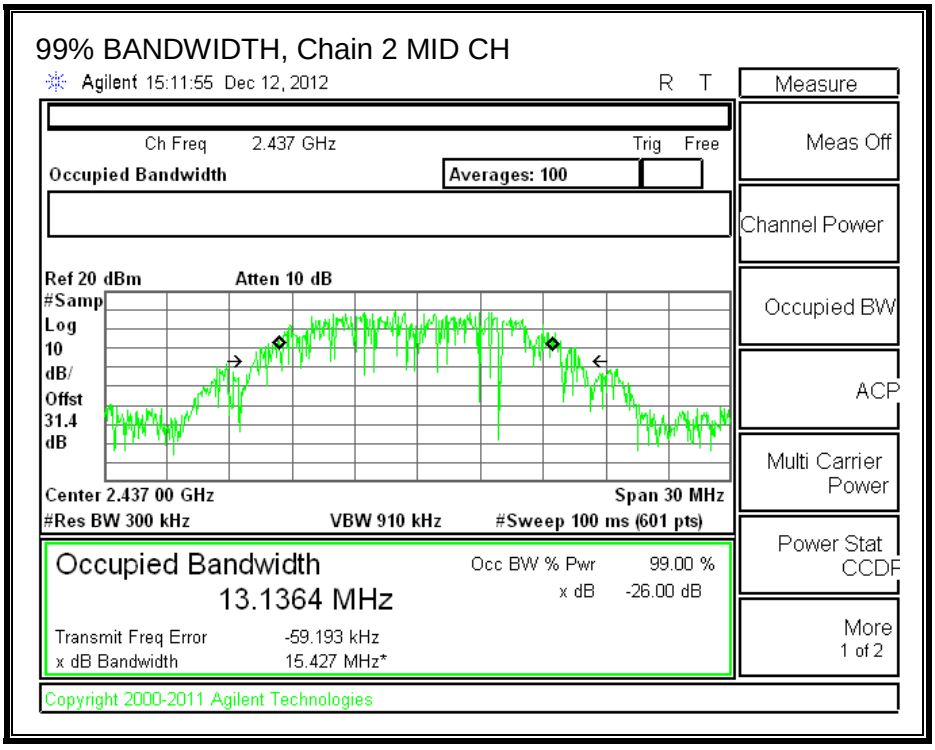


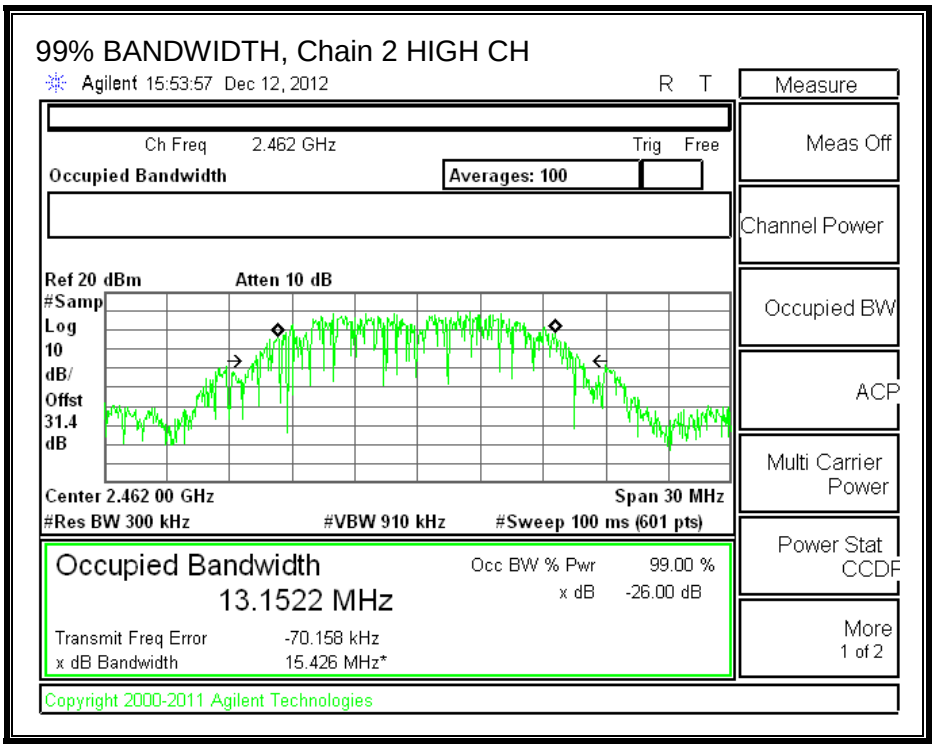




99% BANDWIDTH, Chain 2







8.3.3. OUTPUT AVRAGE POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

For output power consideration, the TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
3.00	3.00	3.10	3.03

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	3.03	30.00	30	36	30.00
Mid	2437	3.03	30.00	30	36	30.00
High	2462	3.03	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low1	2412	15.30	15.85	15.45	20.31	30.00	-9.69
Low2	2417	16.80	17.30	17.10	21.84	30.00	-8.16
Low3	2422	17.90	18.40	18.20	22.94	30.00	-7.06
Mid	2437	20.97	21.40	21.20	25.96	30.00	-4.04
High3	2452	20.99	21.45	21.21	25.99	30.00	-4.01
High2	2457	19.35	19.80	19.56	24.35	30.00	-5.65
High1	2462	18.42	18.81	18.60	23.38	30.00	-6.62

8.3.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247

IC RSS-210 A8.2

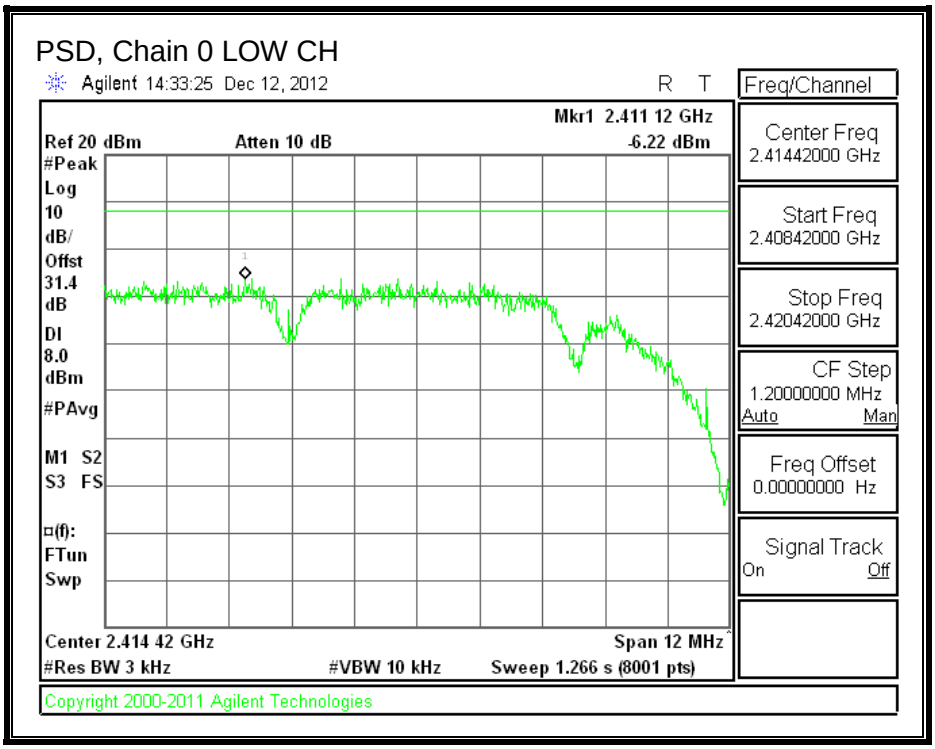
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

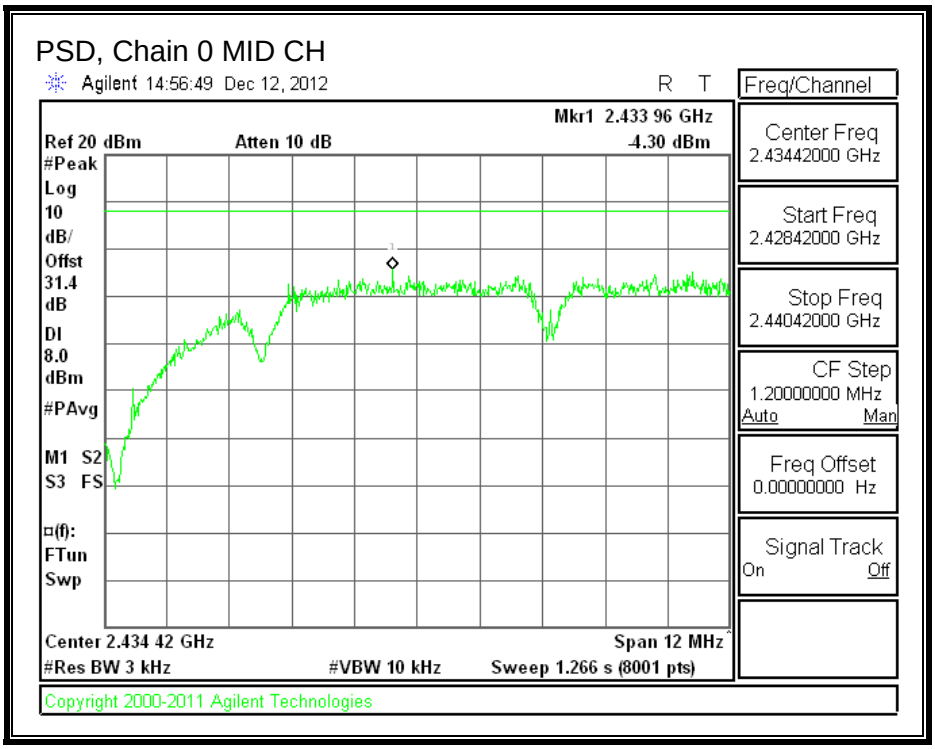
RESULTS

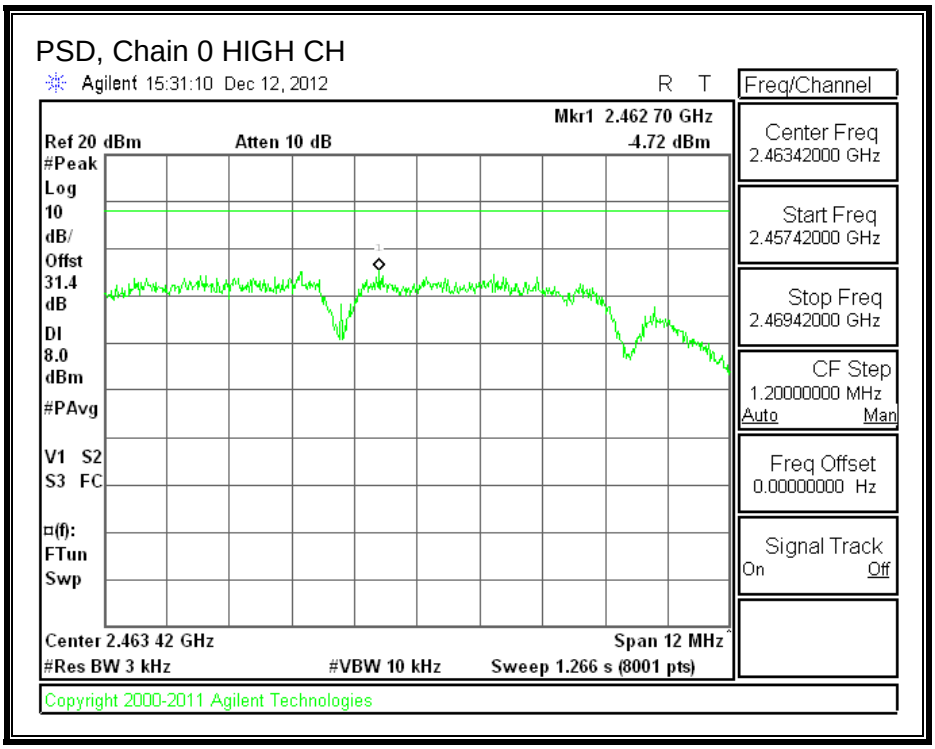
PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Chain 2 Meas (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-6.22	-6.35	-5.78	-1.34	8.0	-9.3
Mid	2437	-4.30	-4.02	-4.78	0.42	8.0	-7.6
High	2462	-4.72	-4.49	-4.87	0.08	8.0	-7.9

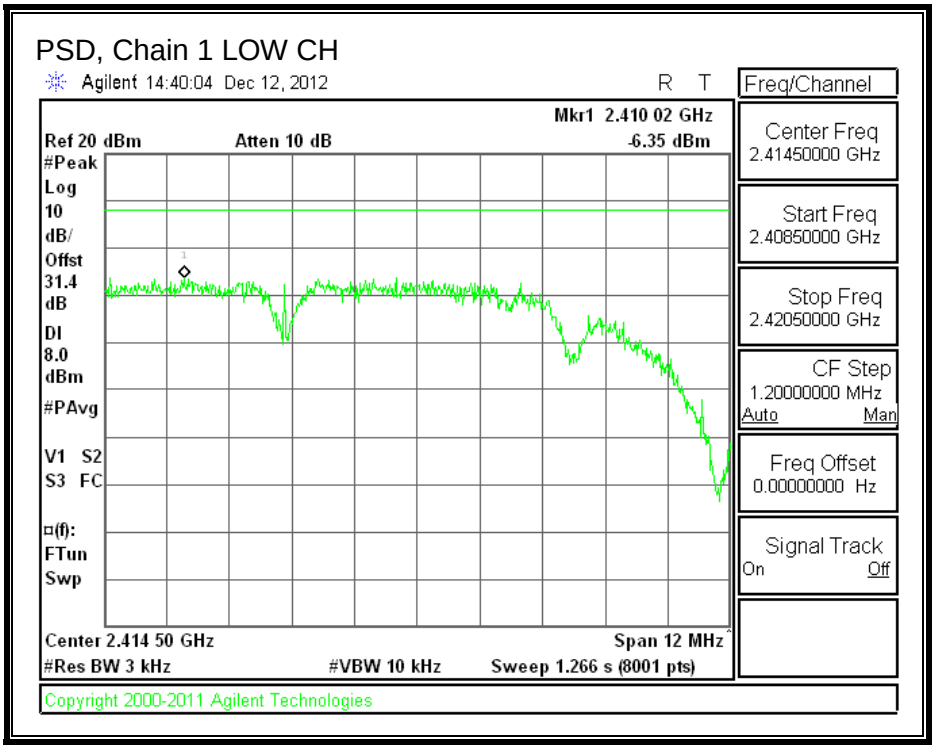
PSD, Chain 0

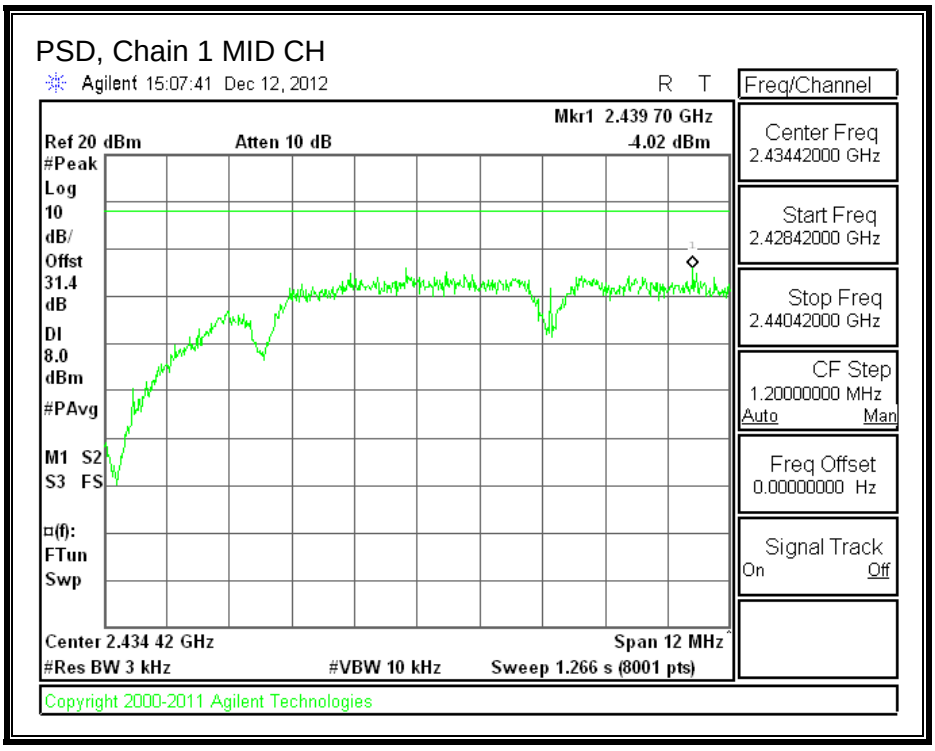


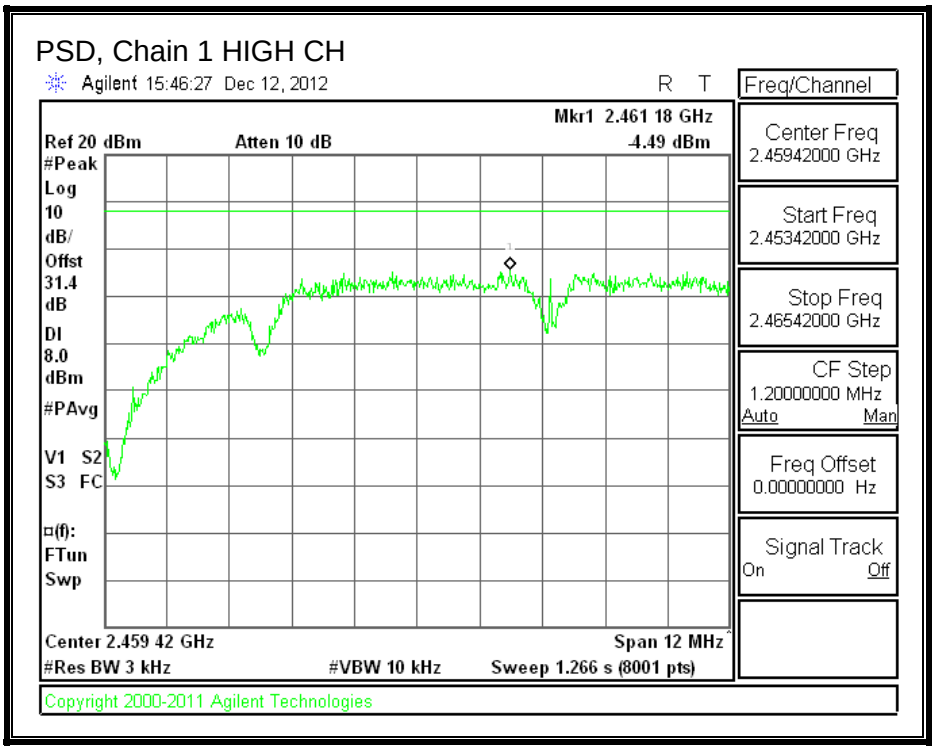




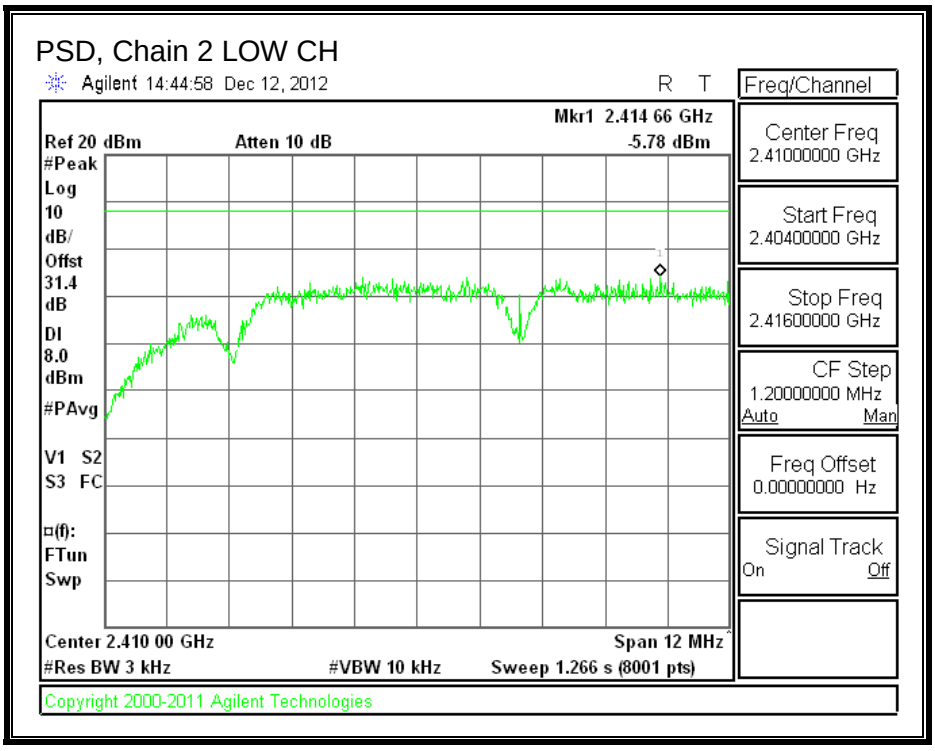
PSD, Chain 1

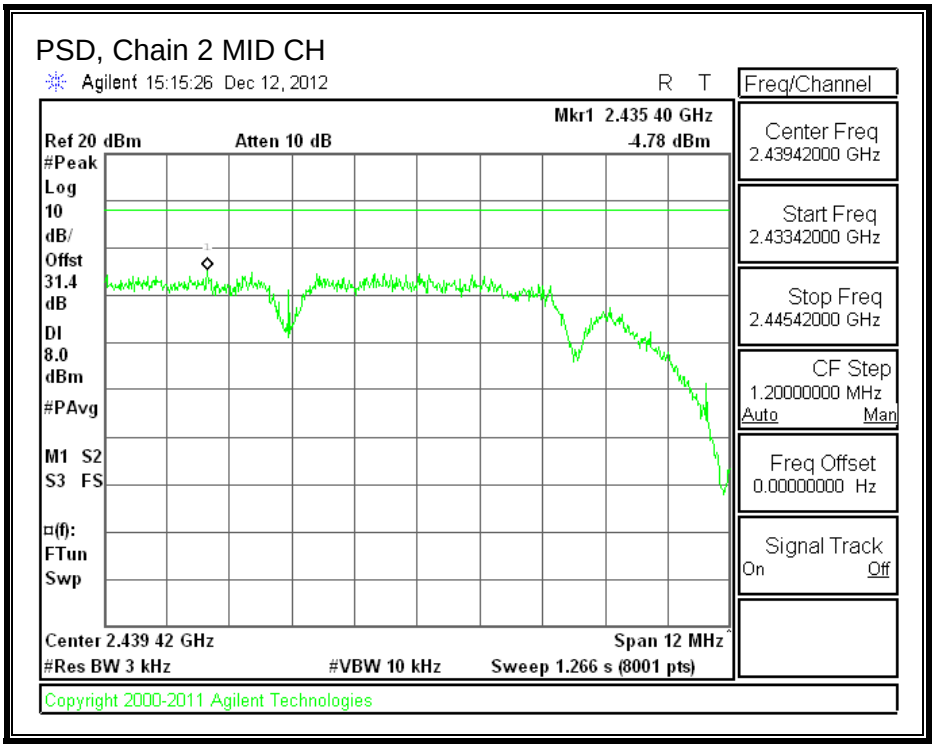




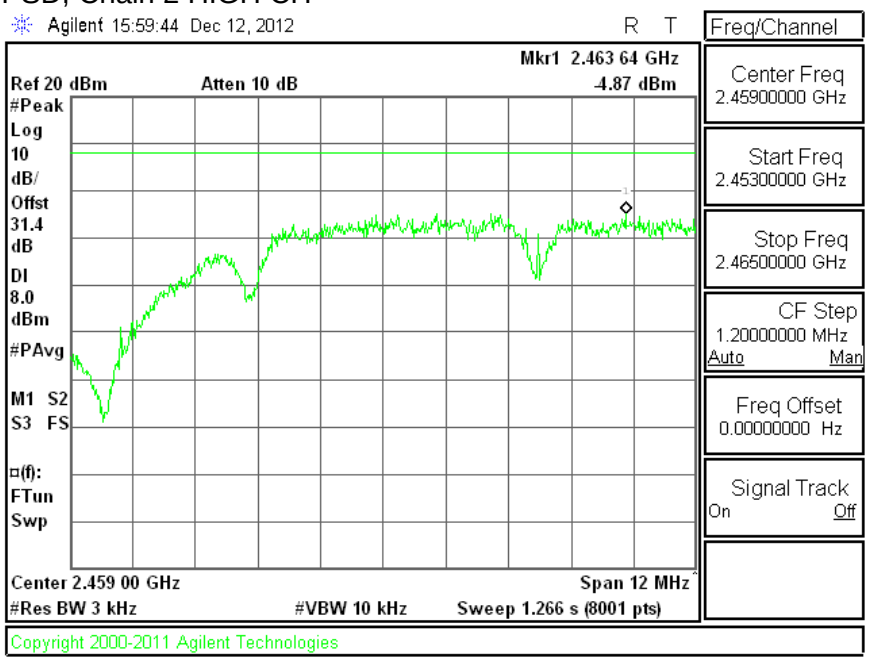


PSD, Chain 2





PSD, Chain 2 HIGH CH



8.3.5. OUT-OF-BAND EMISSIONS

LIMITS

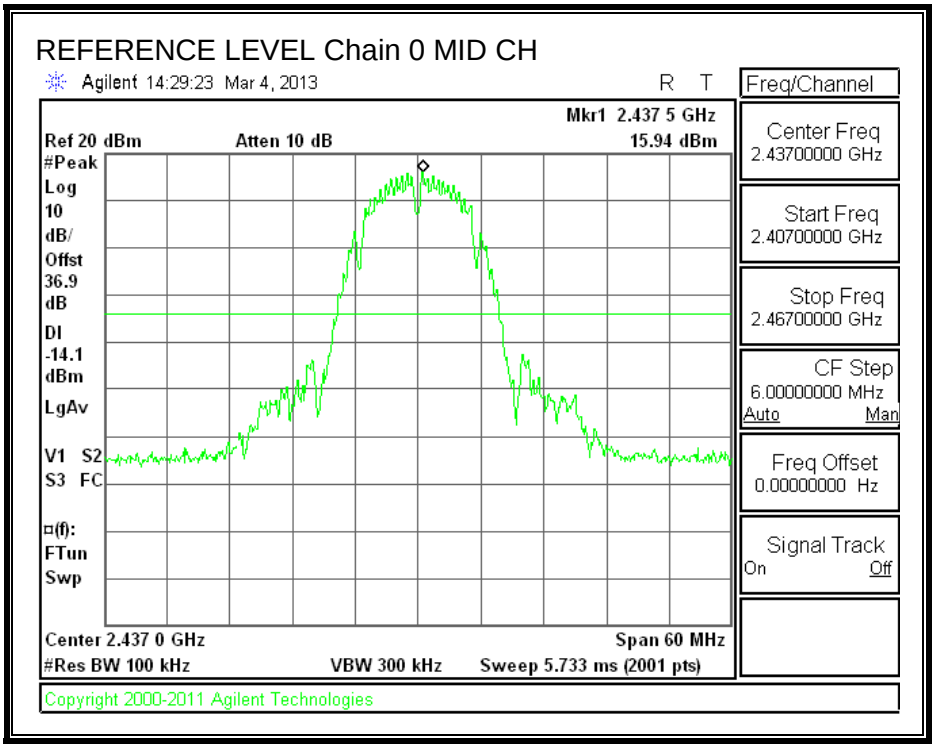
FCC §15.247 (d)

IC RSS-210 A8.5

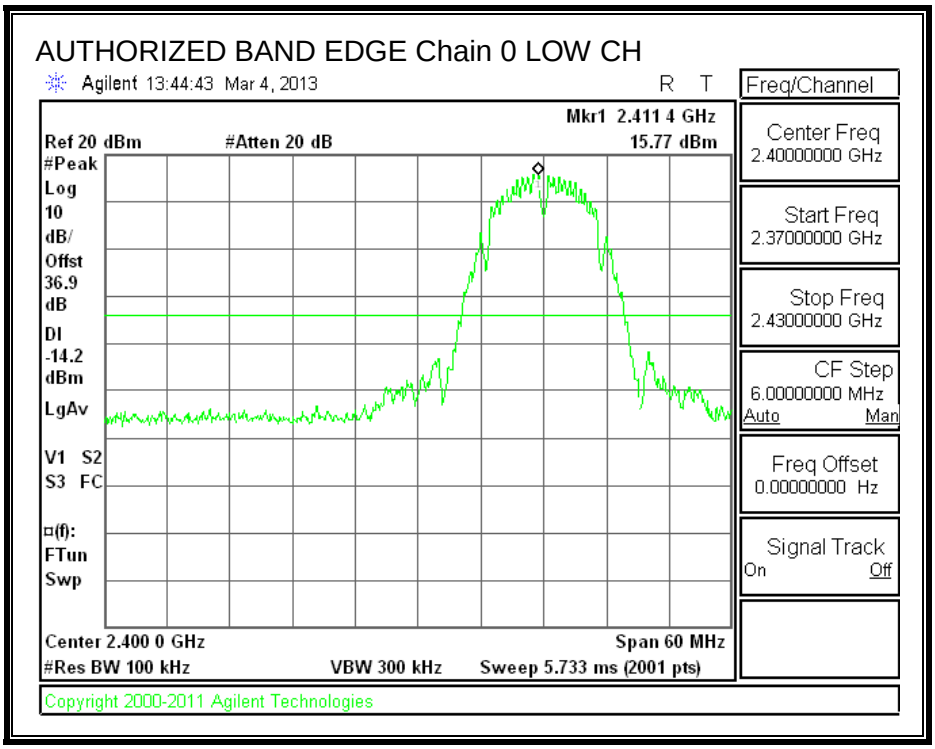
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

RESULTS

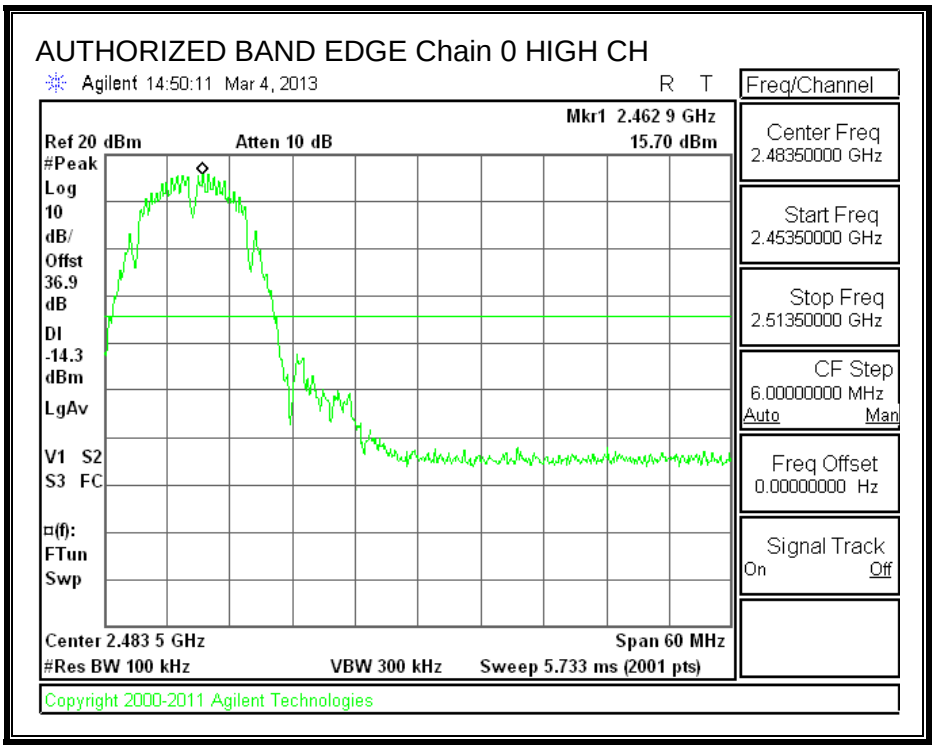
IN-BAND REFERENCE LEVEL, Chain 0



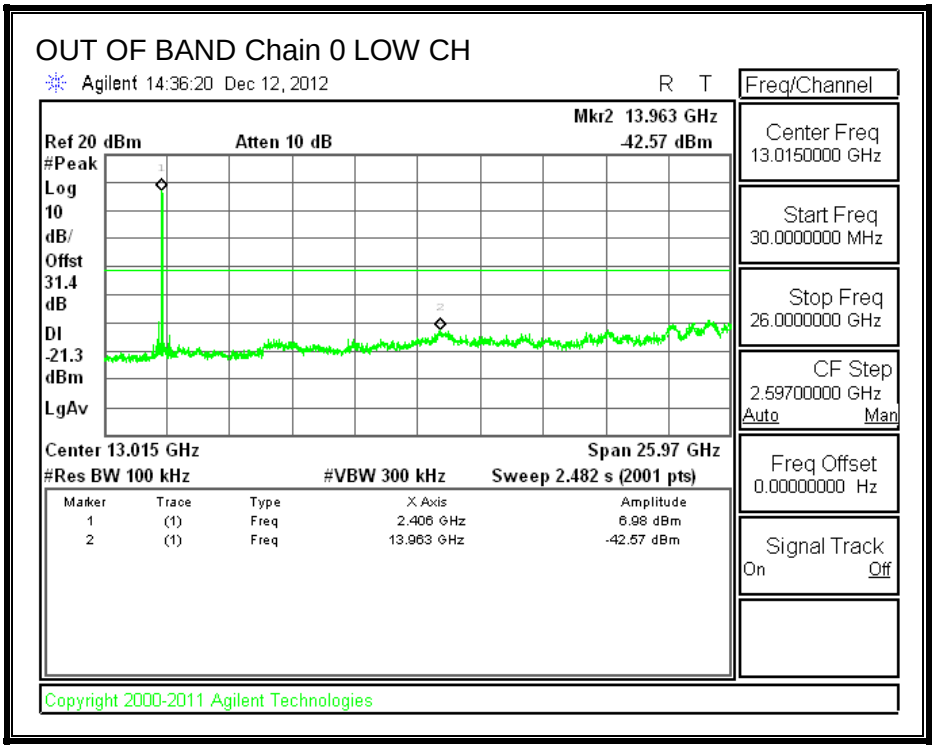
LOW CHANNEL BANDEDGE, Chain 0

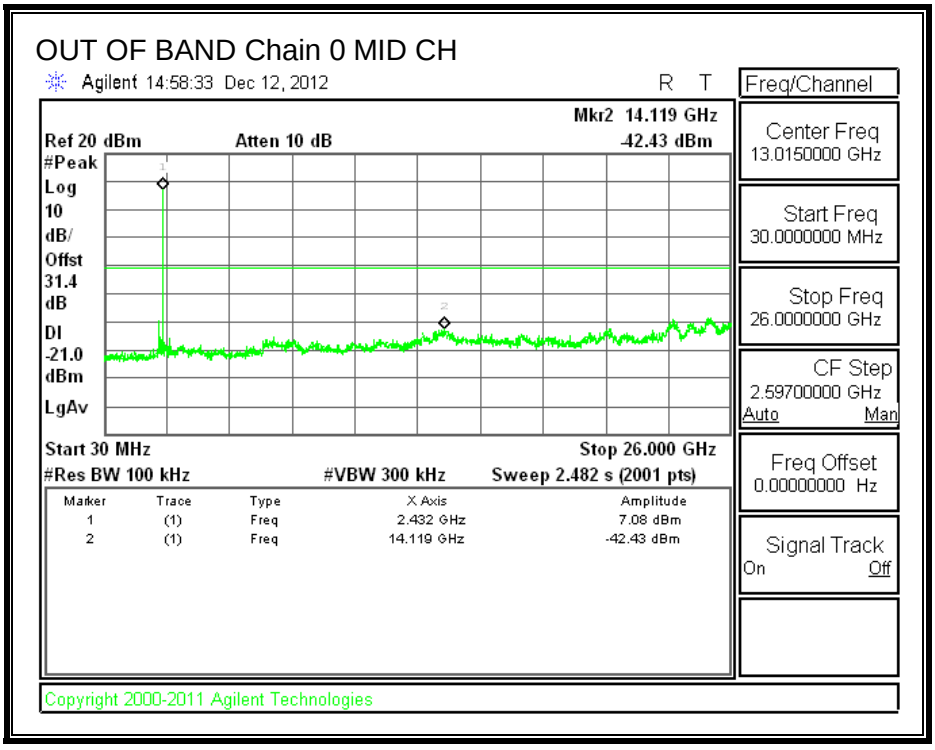


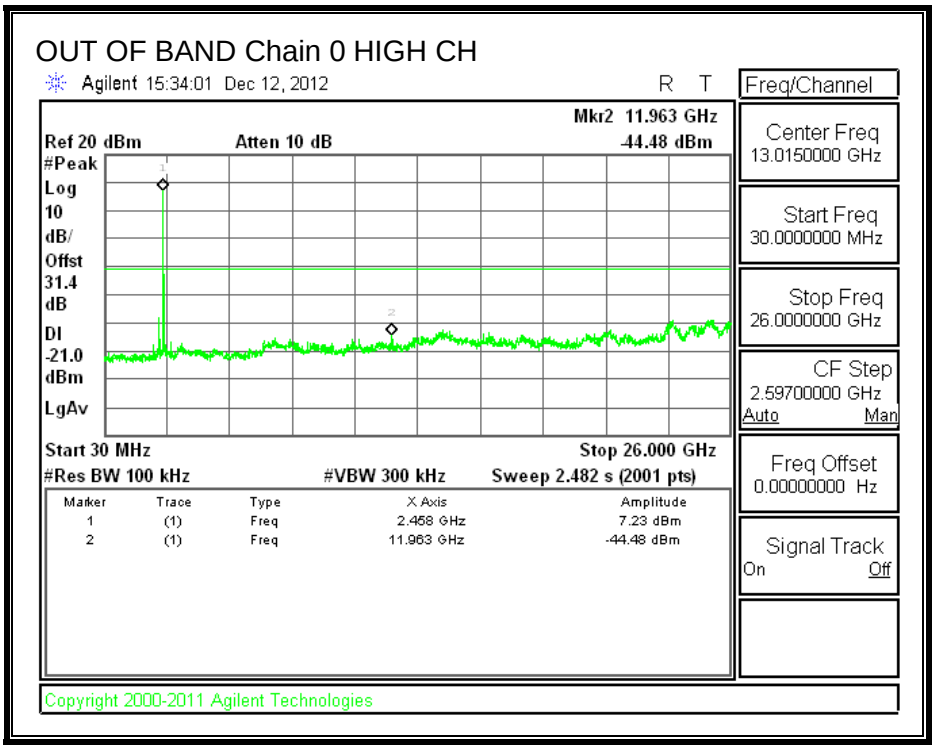
HIGH CHANNEL BANDEDGE, Chain 0



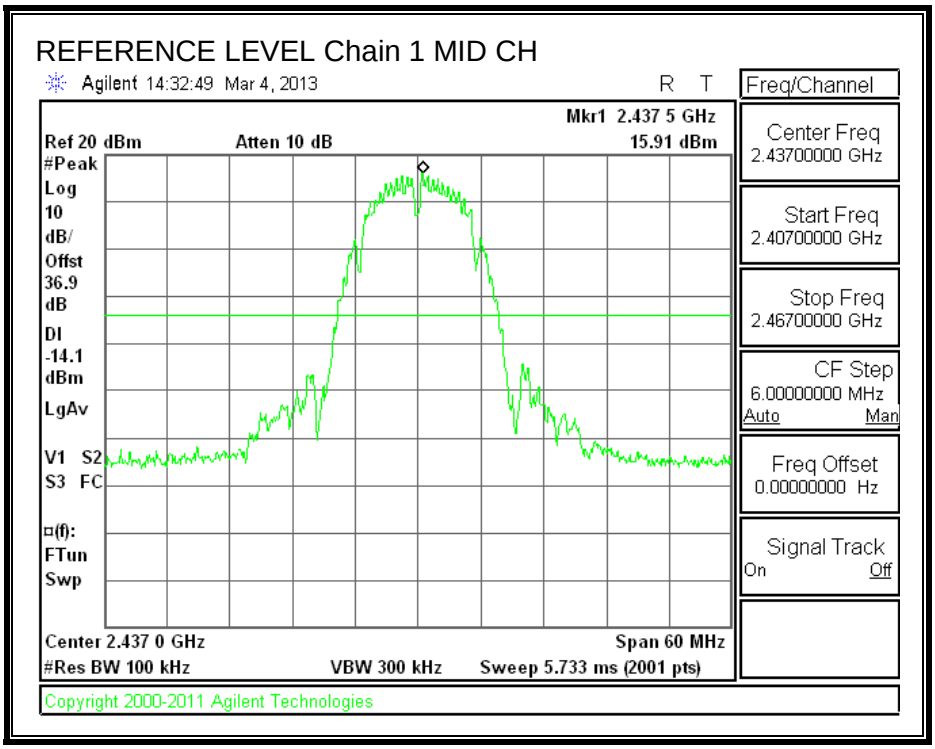
OUT-OF-BAND EMISSIONS, Chain 0



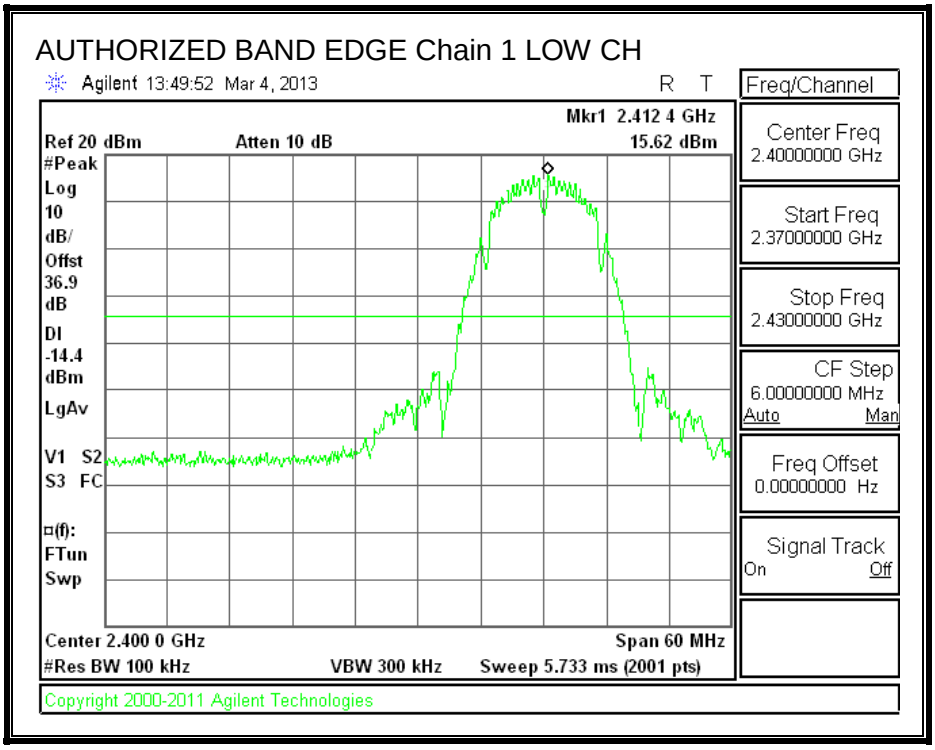




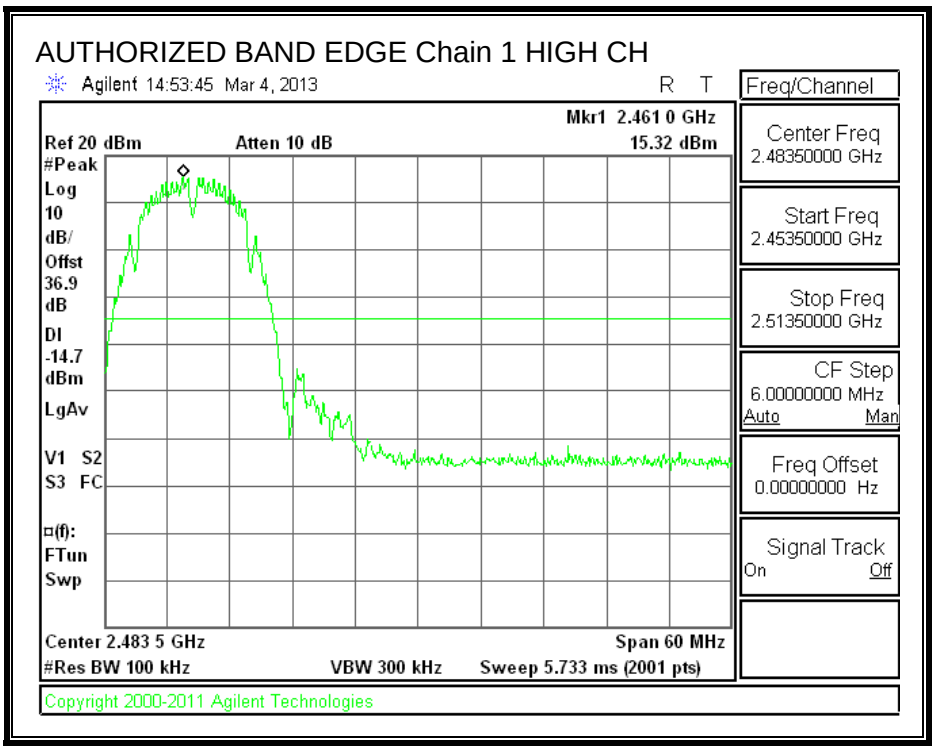
IN-BAND REFERENCE LEVEL, Chain 1



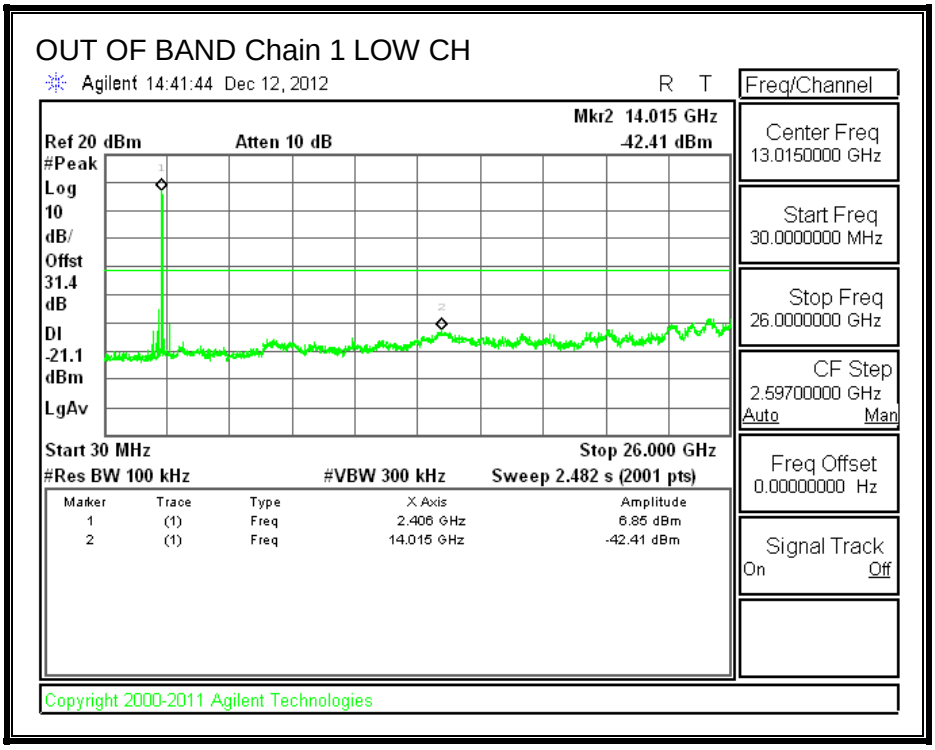
LOW CHANNEL BANDEDGE, Chain 1

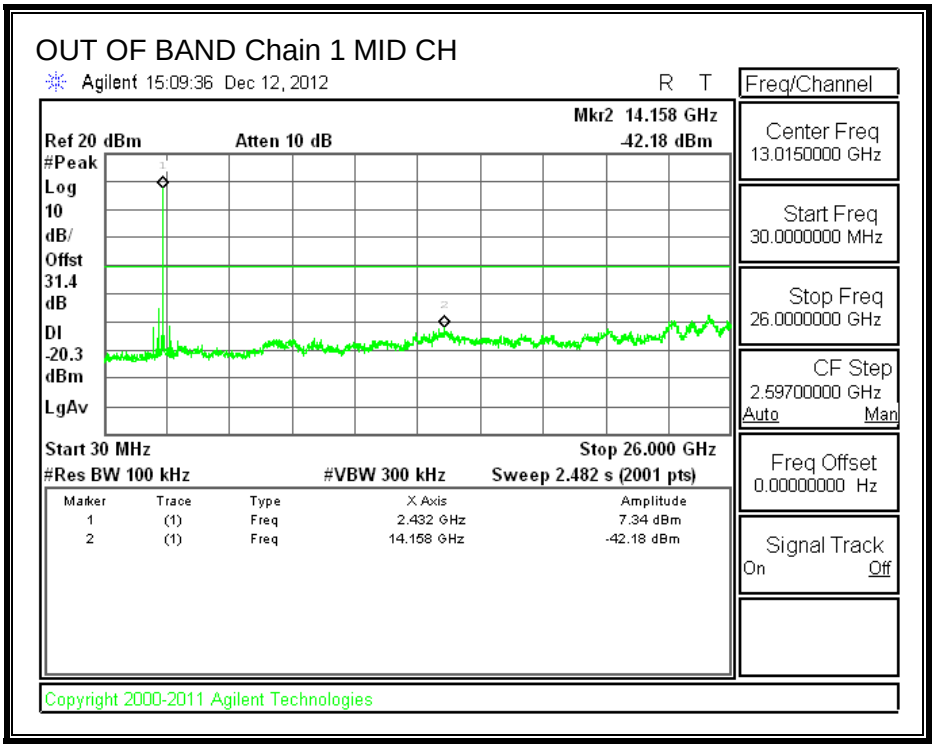


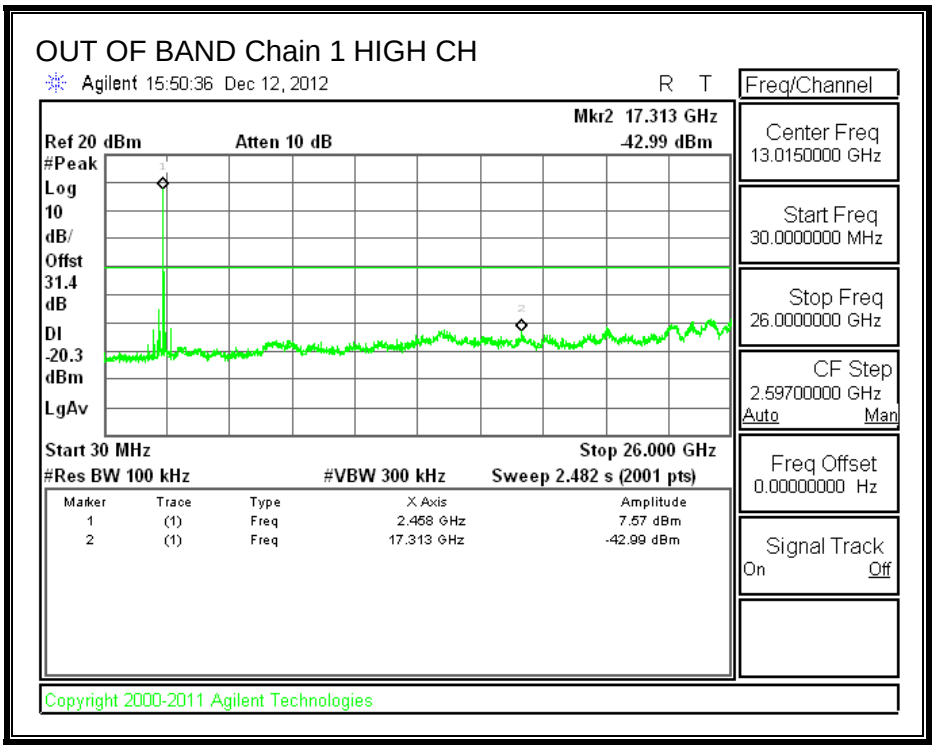
HIGH CHANNEL BANDEDGE, Chain 1



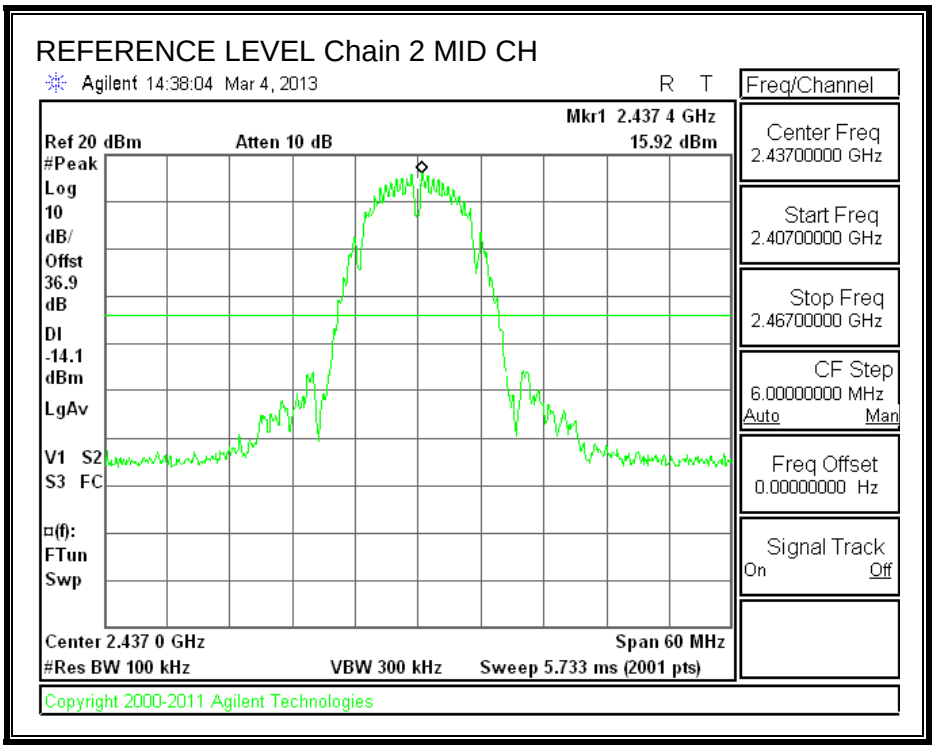
OUT-OF-BAND EMISSIONS, Chain 1



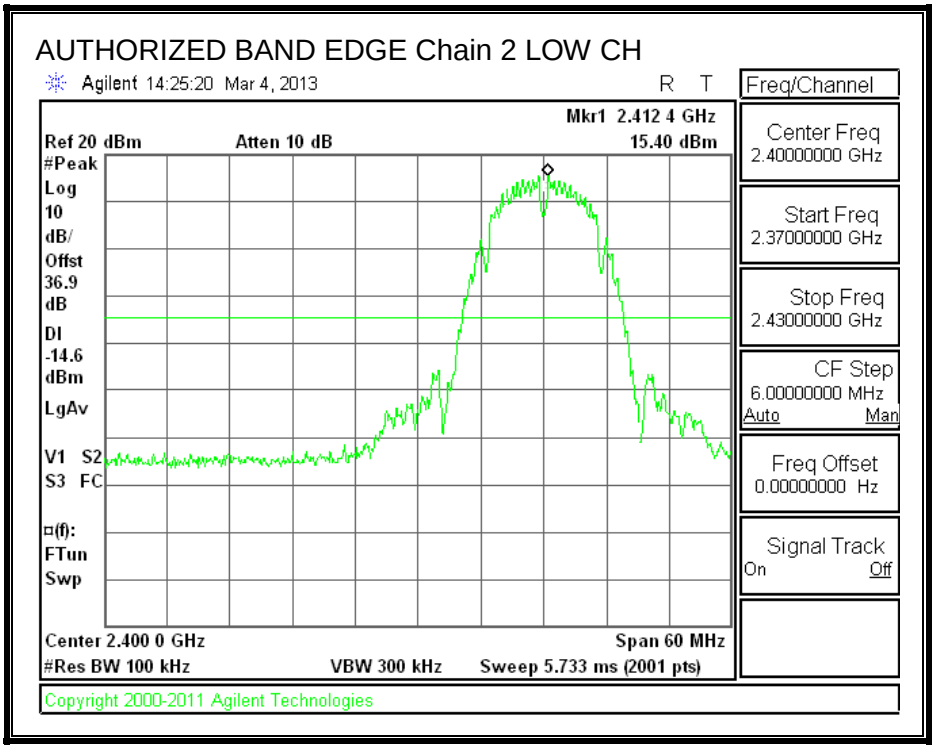




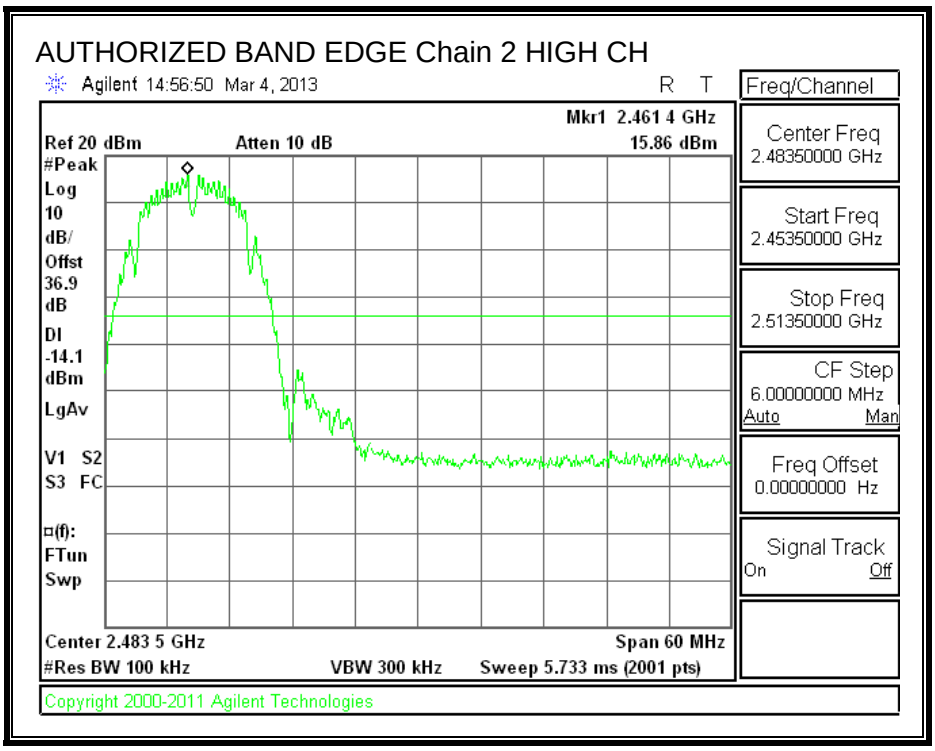
IN-BAND REFERENCE LEVEL, Chain 2



LOW CHANNEL BANDEDGE, Chain 2

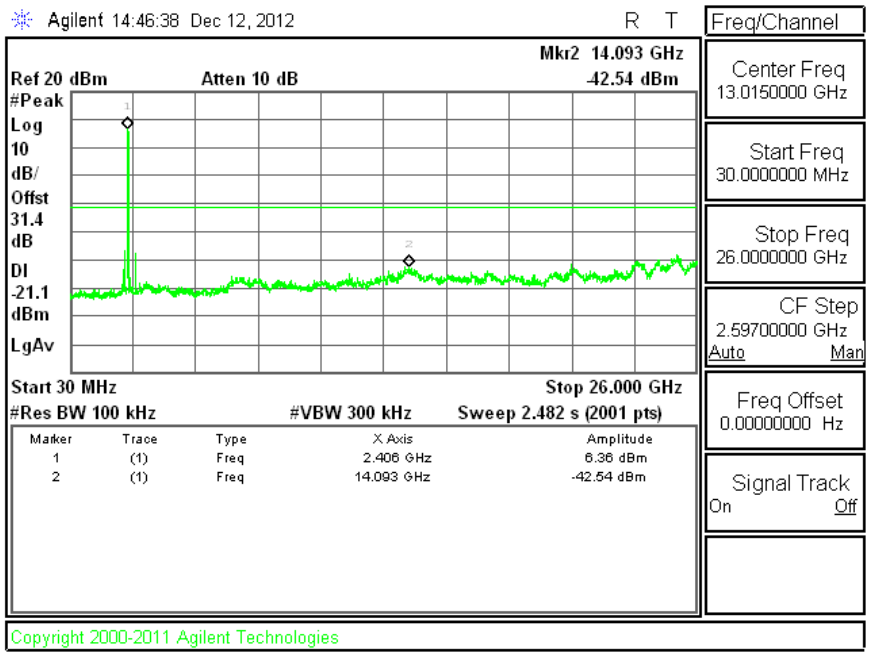


HIGH CHANNEL BANDEDGE, Chain 2

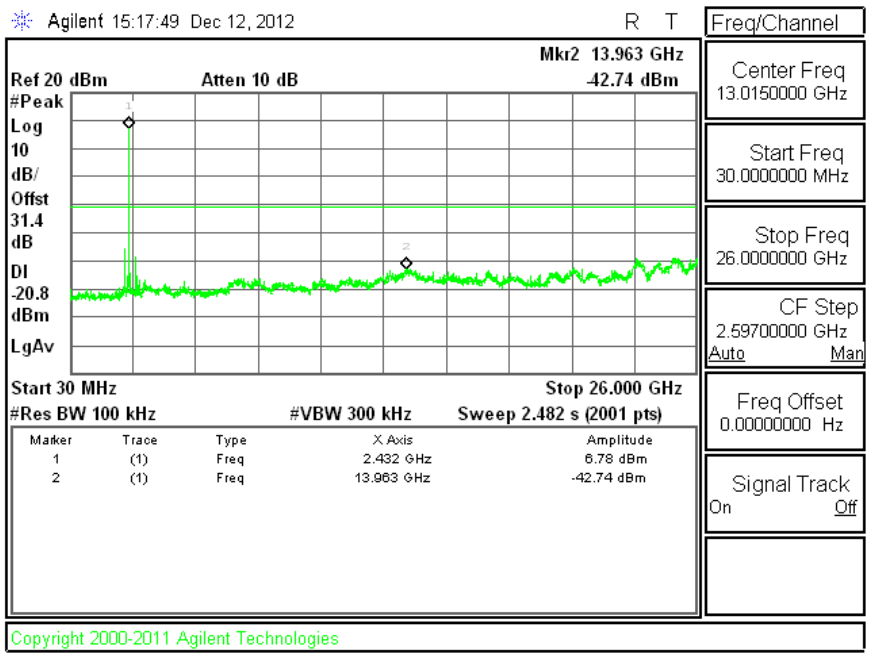


OUT-OF-BAND EMISSIONS, Chain 2

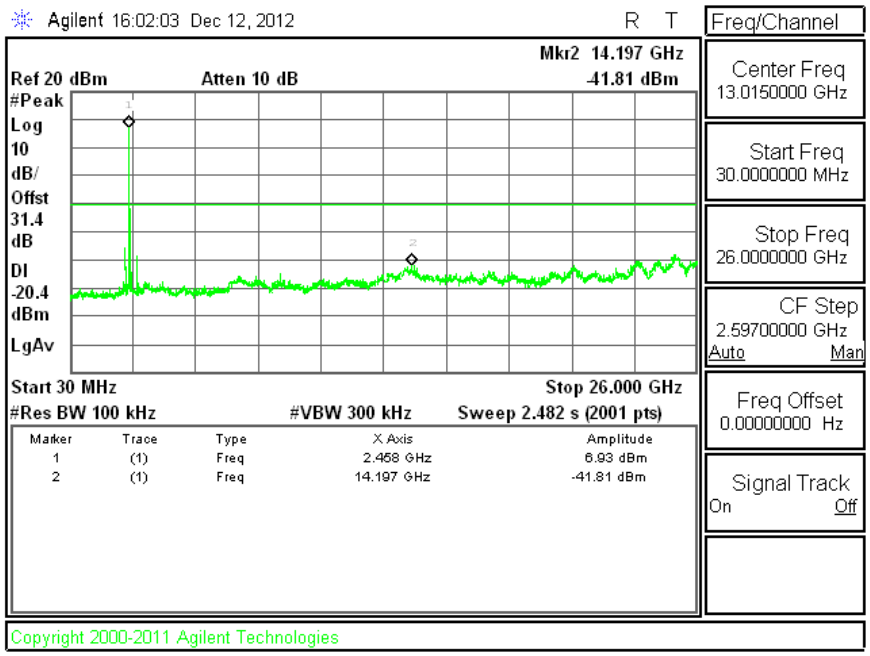
OUT OF BAND Chain 2 LOW CH



OUT OF BAND Chain 2 MID CH



OUT OF BAND Chain 2 HIGH CH



8.4. 802.11g 1TX MODE IN THE 2.4 GHz BAND

8.4.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

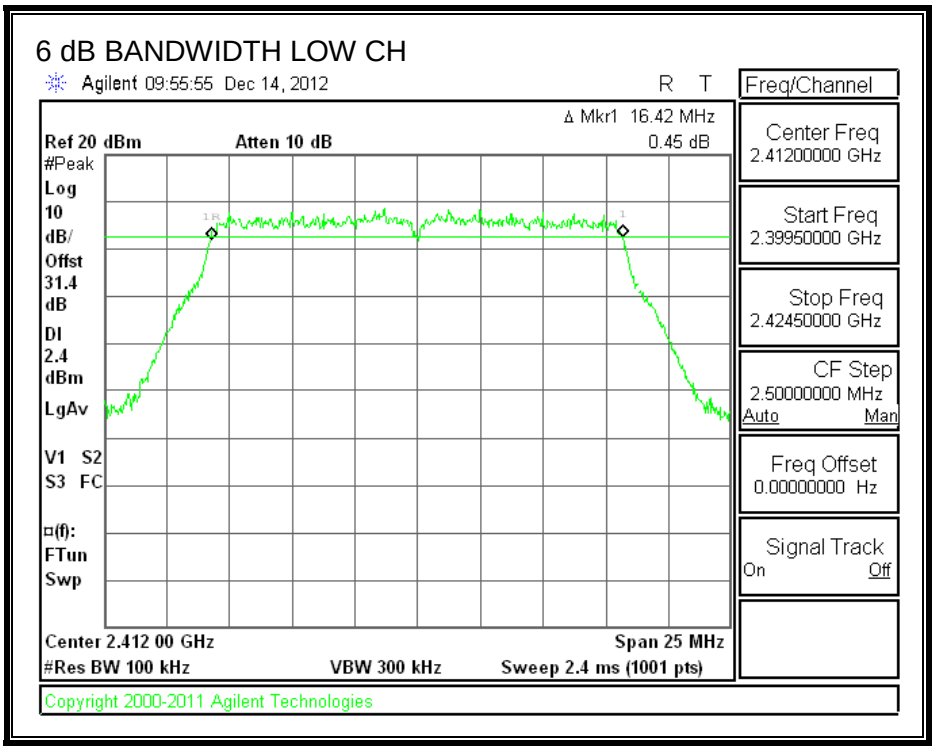
IC RSS-210 A8.2 (a)

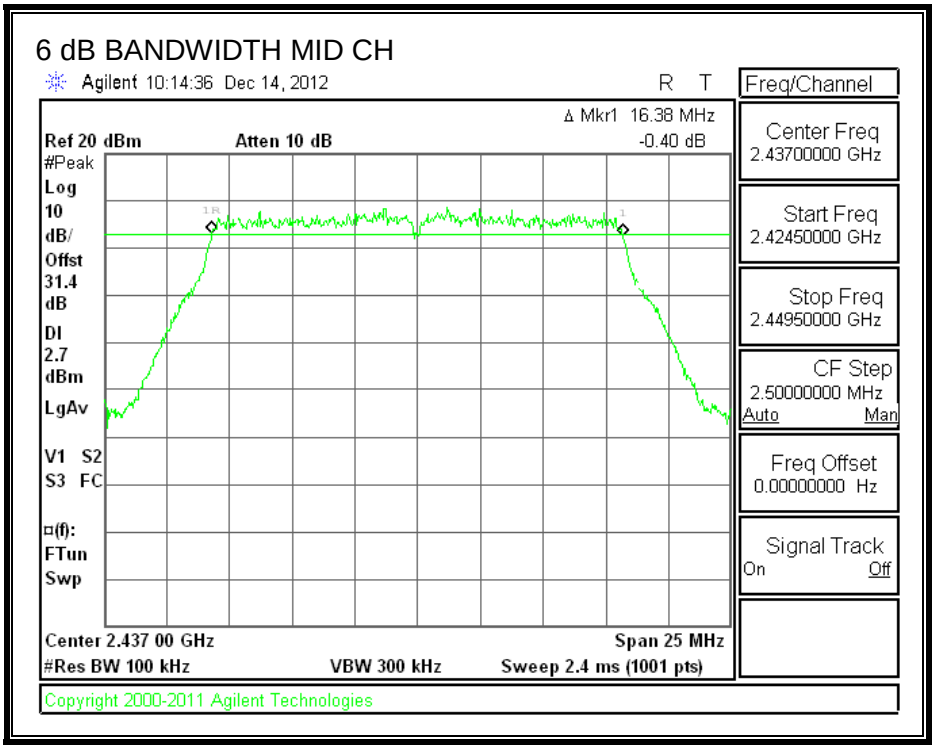
The minimum 6 dB bandwidth shall be at least 500 kHz.

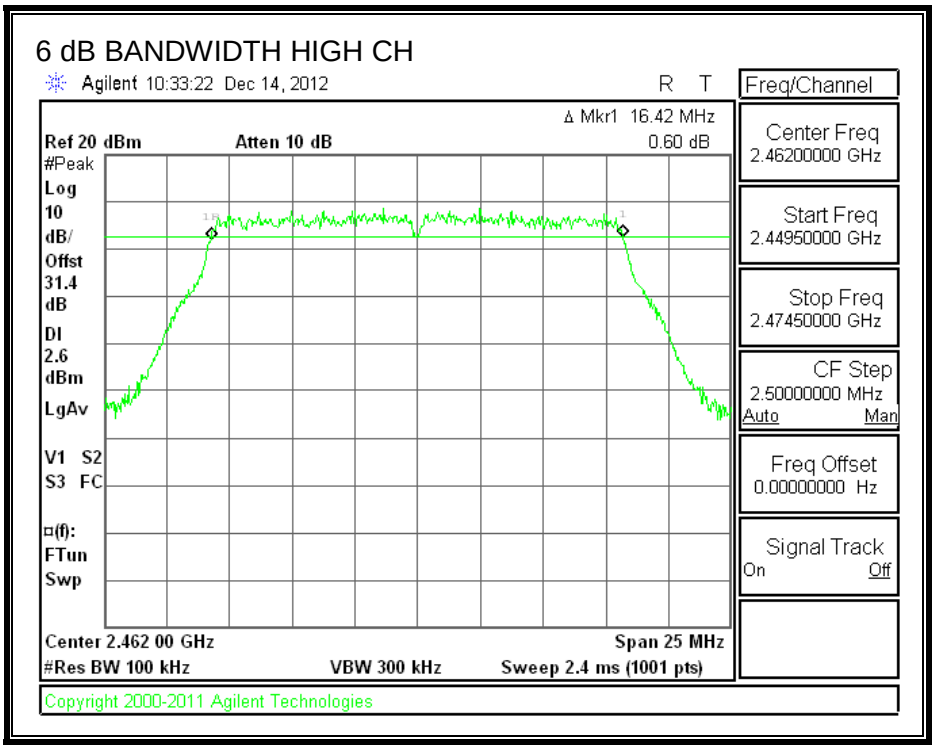
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.42	0.5
Mid	2437	16.38	0.5
High	2462	16.42	0.5

6 dB BANDWIDTH







8.4.2. 99% BANDWIDTH

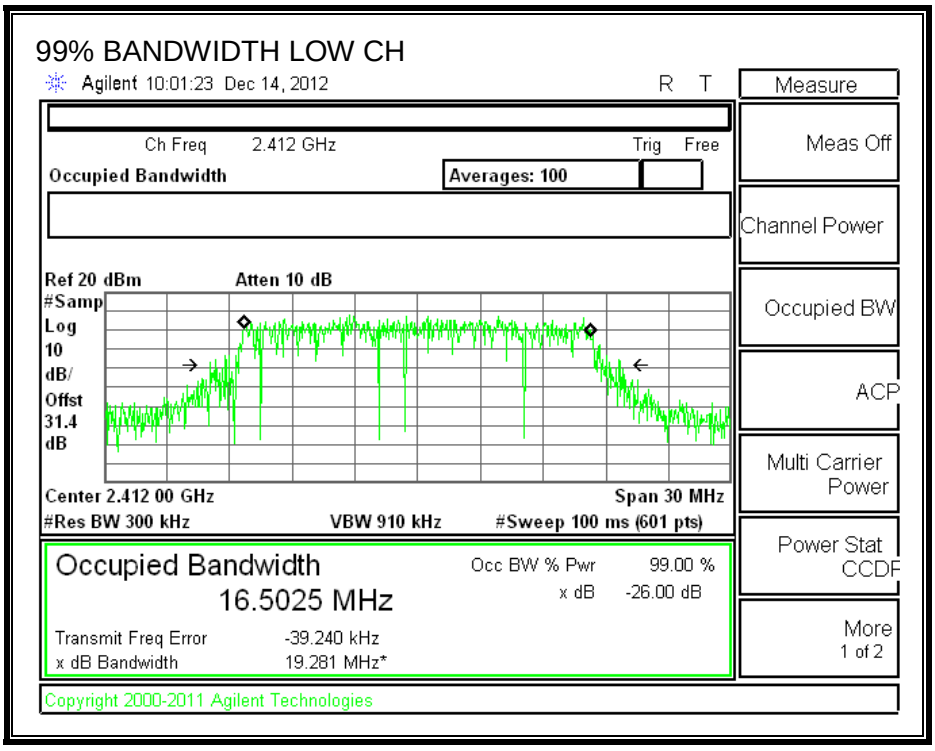
LIMITS

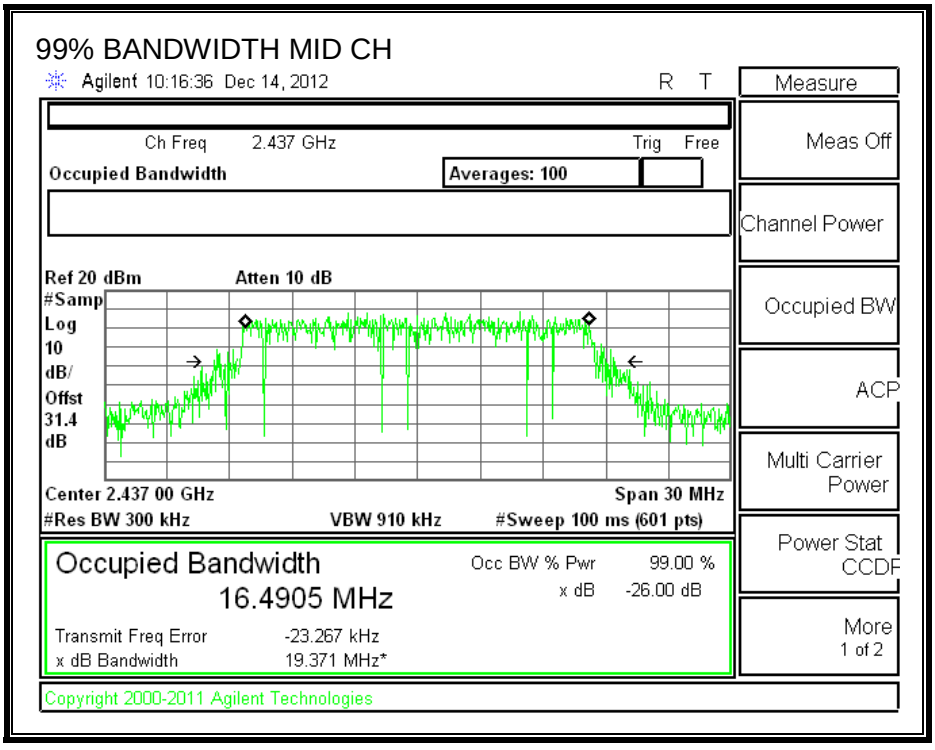
None; for reporting purposes only.

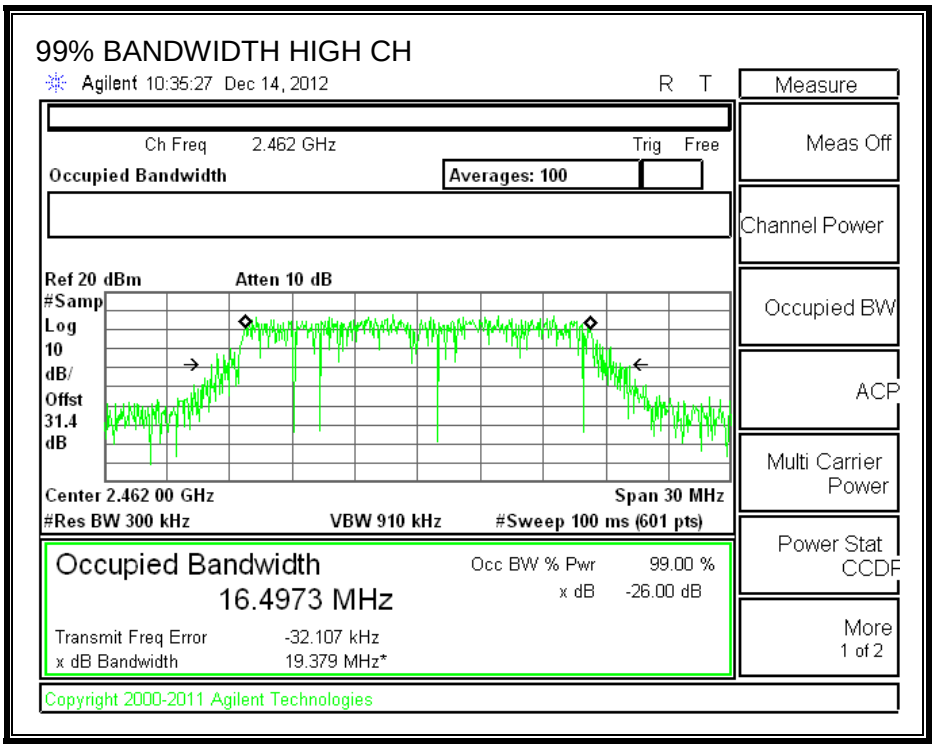
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.5025
Mid	2437	16.4905
High	2462	16.4973

99% BANDWIDTH







8.4.3. OUTPUT AVERAGE POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	3.10	30.00	30	36	30.00
Mid	2437	3.10	30.00	30	36	30.00
High	2462	3.10	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low1	2412	16.60	16.60	30.00	-13.40
Low2	2417	17.60	17.60	30.00	-12.40
Low3	2422	18.50	18.50	30.00	-11.50
Mid	2437	23.00	23.00	30.00	-7.00
High3	2452	20.20	20.20	30.00	-9.80
High2	2457	18.10	18.10	30.00	-11.90
High1	2462	16.00	16.00	30.00	-14.00

8.4.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247

IC RSS-210 A8.2

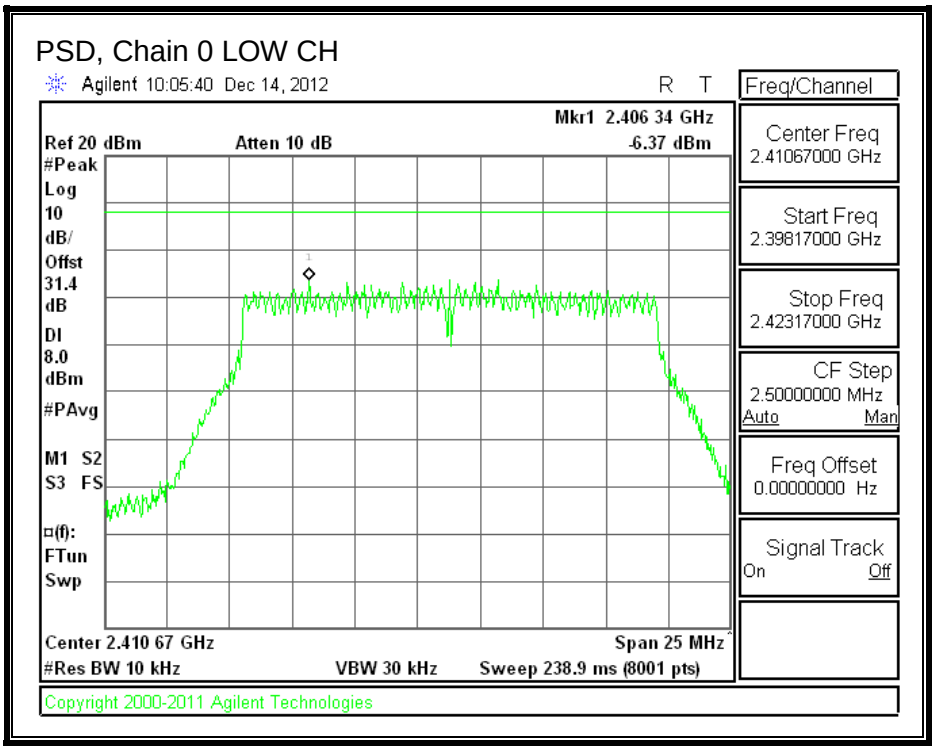
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

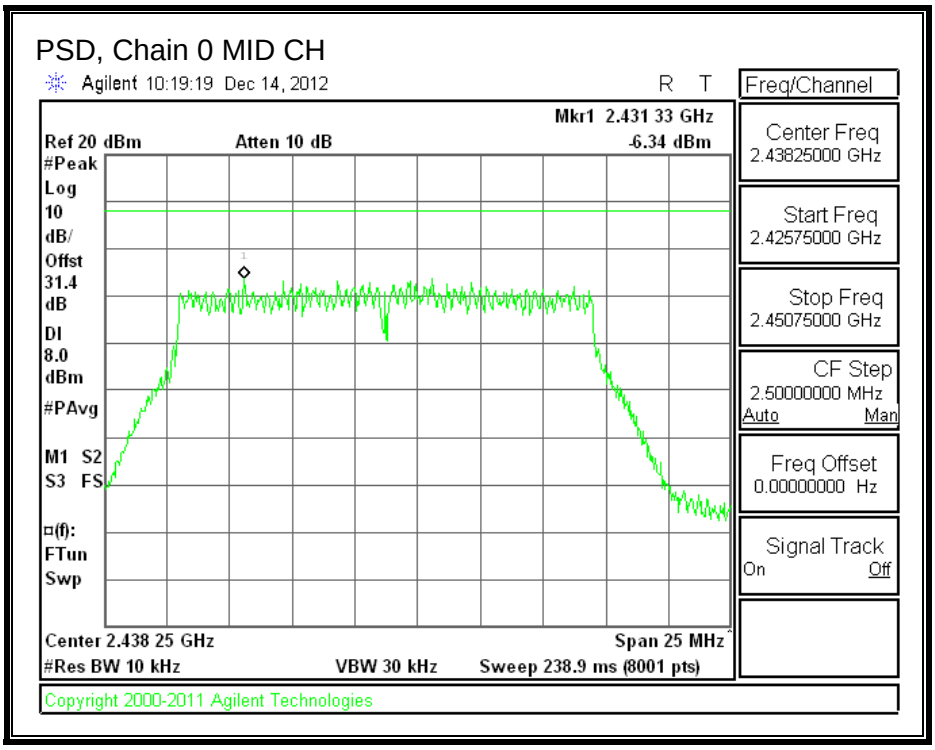
RESULTS

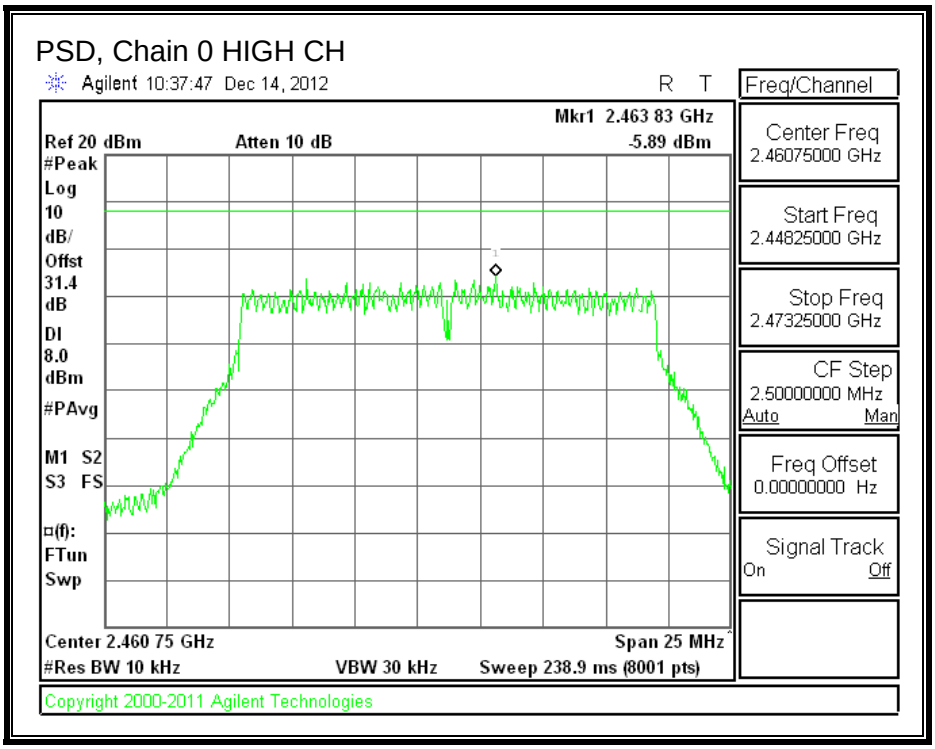
PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-6.37	8.0	-14.4
Mid	2437	-6.34	8.0	-14.3
High	2462	-5.89	8.0	-13.9

PSD, Chain 0







8.4.5. OUT-OF-BAND EMISSIONS

LIMITS

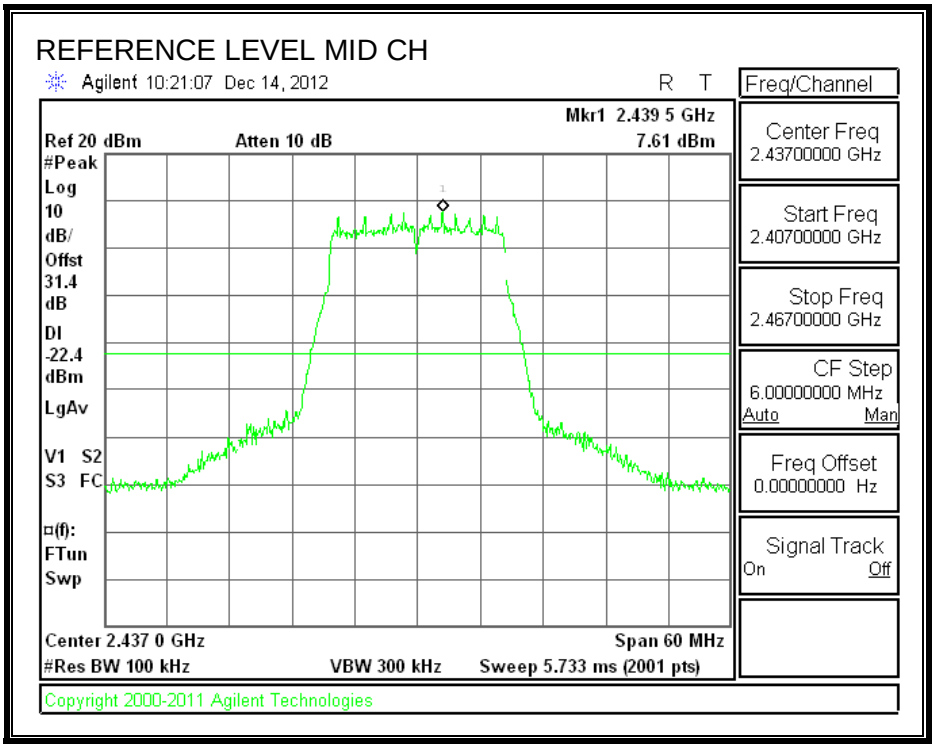
FCC §15.247 (d)

IC RSS-210 A8.5

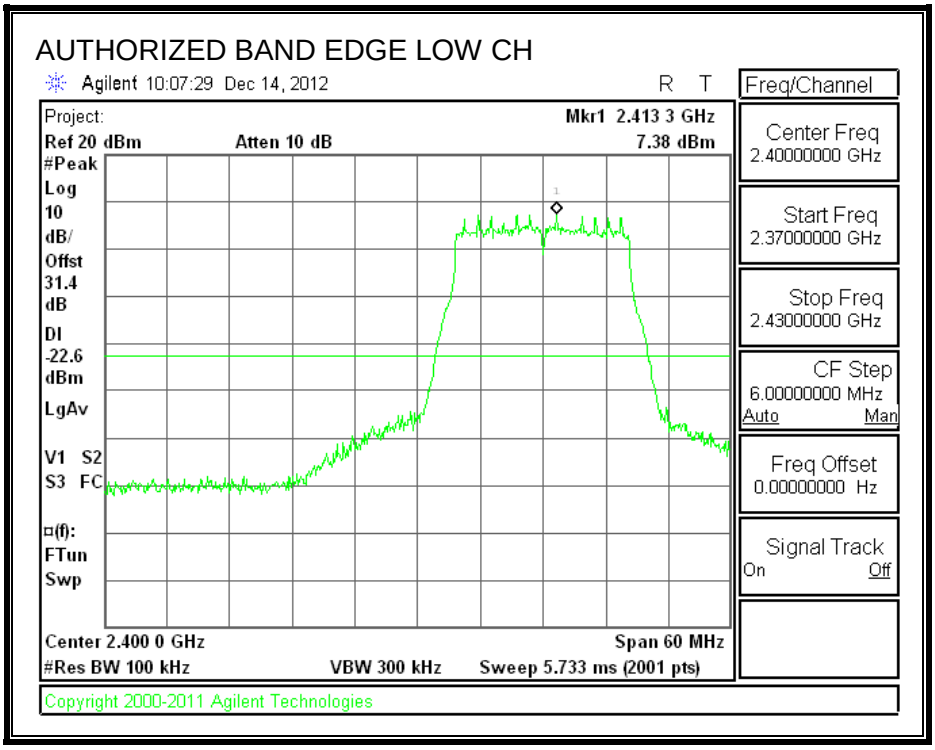
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

RESULTS

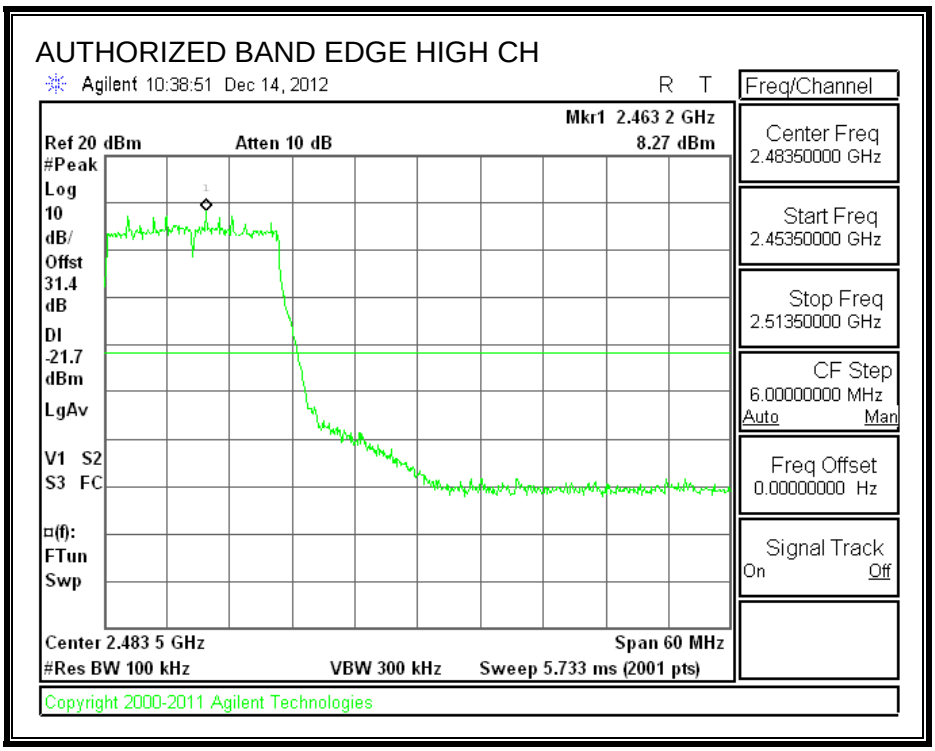
IN-BAND REFERENCE LEVEL



LOW CHANNEL BANDEDGE

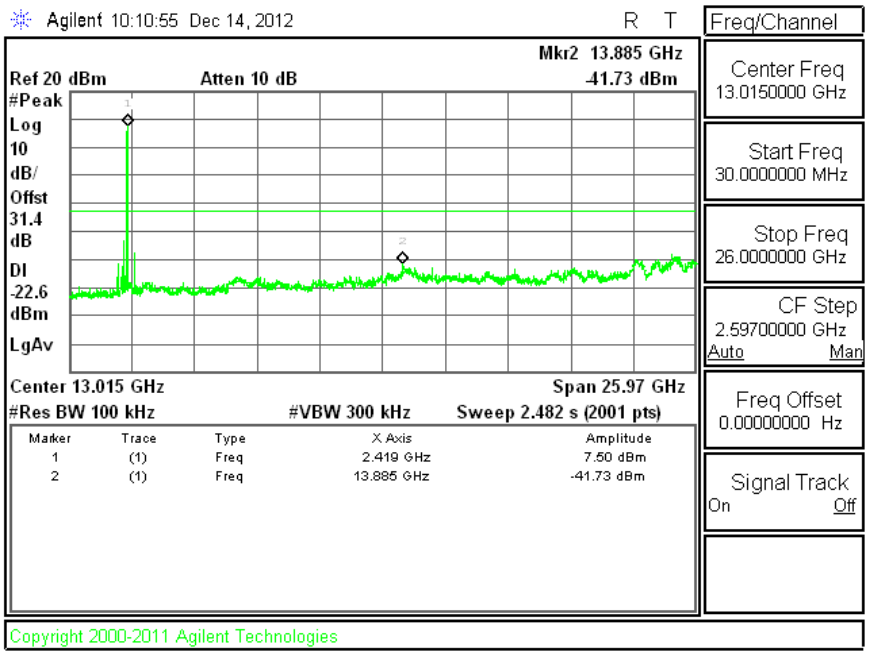


HIGH CHANNEL BANDEDGE

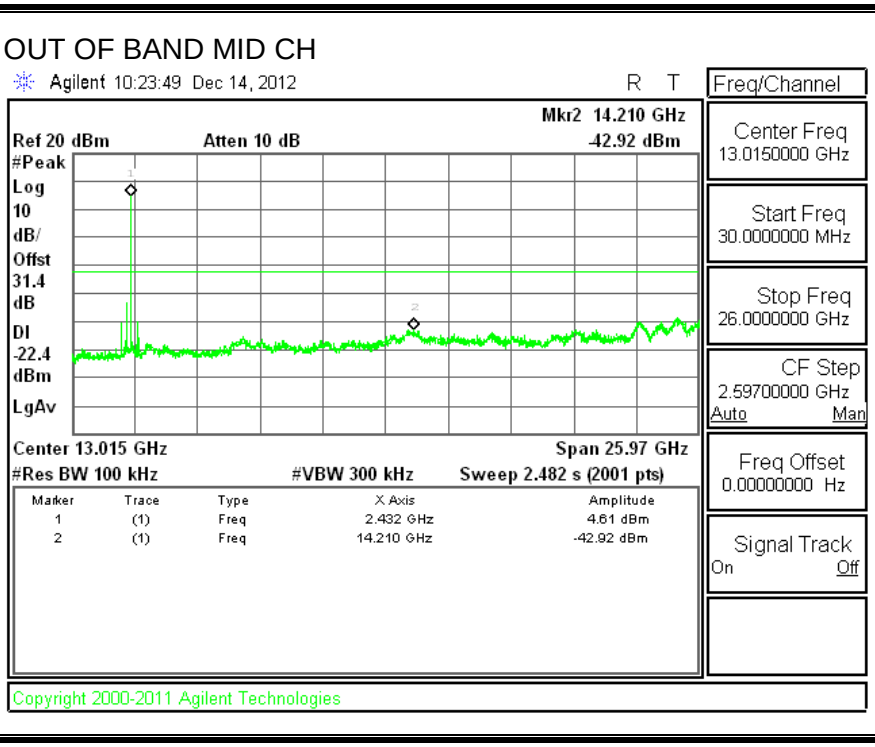


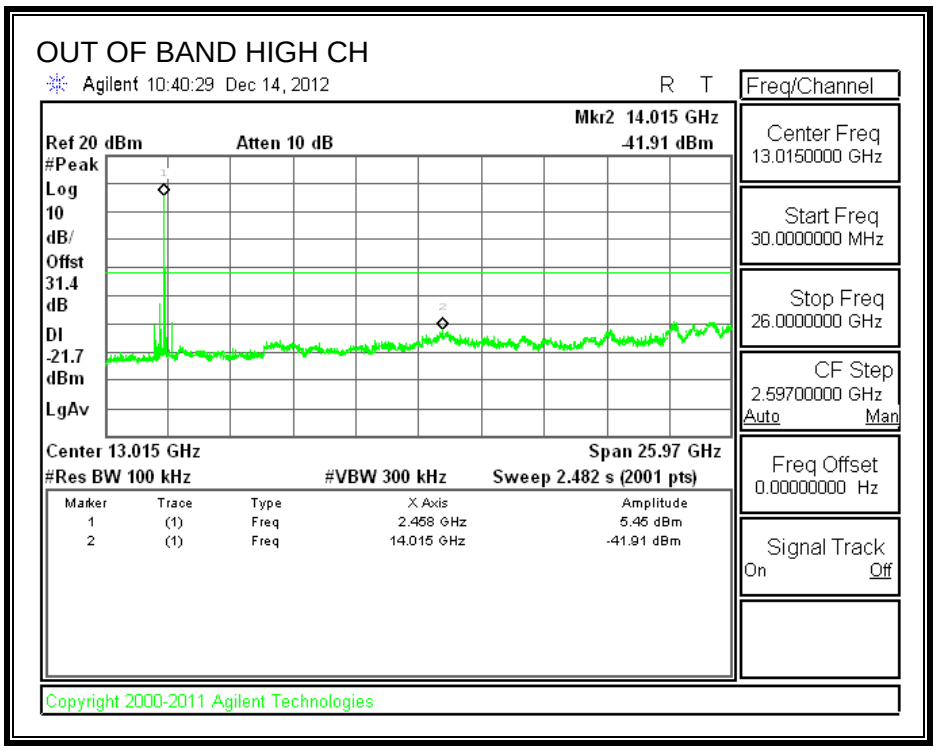
OUT-OF-BAND EMISSIONS

OUT OF BAND LOW CH



OUT OF BAND MID CH





8.5. 802.11g 2TX MODE IN THE 2.4 GHz BAND

Covered by testing 802.11n HT20 2TX mode, power per chain used for 802.11n HT20 2TX mode is higher than the power per chain for 802.11g 2TX mode that the device will operate at.

8.6. 802.11g 3TX MODE IN THE 2.4 GHz BAND

Covered by testing 802.11n HT20 3TX mode, power per chain used for 802.11n HT20 3TX mode is higher than the power per chain for 802.11g 3TX mode that the device will operate at.

8.7. 802.11n HT20 1TX MODE IN THE 2.4 GHz BAND

Covered by testing 802.11g 1TX mode, power per chain used for 802.11g 1TX mode is higher than the power per chain for 802.11n HT20 mode that the device will operate at.

8.8. 802.11n HT20 BF 2TX MODE IN THE 2.4 GHz BAND

Covered by testing 11n HT20 CDD MCS0 2TX, total power across all three chains is higher than the power level the device will operate at.

8.8.1. OUTPUT AVERAGE POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

For output power, the TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.00	3.10	6.06

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	6.06	29.94	30	36	29.94
Mid	2437	6.06	29.94	30	36	29.94
High	2462	6.06	29.94	30	36	29.94

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margi (dB)
Low1	2412	16.20	16.00	19.11	29.94	-10.83
Low2	2417	17.70	17.50	20.61	29.94	-9.33
Low3	2422	18.60	18.40	21.51	29.94	-8.43
Mid	2437	23.20	23.00	26.11	29.94	-3.83
High3	2452	20.25	20.00	23.14	29.94	-6.80
High2	2457	18.25	18.10	21.19	29.94	-8.75
High1	2462	16.60	16.40	19.51	29.94	-10.43

8.9. 802.11n HT20 BF 3TX MODE IN THE 2.4 GHz BAND

Covered by testing 11n HT20 CCD MCS0 3TX, total power across all three chains is higher than the power level the device will operate at.

8.9.1. OUTPUT AVERAGE POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
3.00	3.00	3.10	7.80

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	7.80	28.20	30	36	28.20
Mid	2437	7.80	28.20	30	36	28.20
High	2462	7.80	28.20	30	36	28.20

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low1	2412	14.90	15.50	15.30	20.01	28.20	-8.19
Low2	2417	15.90	16.30	16.15	20.89	28.20	-7.31
Low3	2422	16.90	17.25	17.05	21.84	28.20	-6.36
Mid	2437	21.90	22.50	22.30	27.01	28.20	-1.19
High3	2452	18.45	18.86	18.60	23.41	28.20	-4.79
High2	2457	16.90	17.30	17.05	21.86	28.20	-6.34
High1	2462	15.00	15.80	15.50	20.22	28.20	-7.98

8.10. 802.11n HT20 CDD 2TX MODE IN THE 2.4 GHz BAND

8.10.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

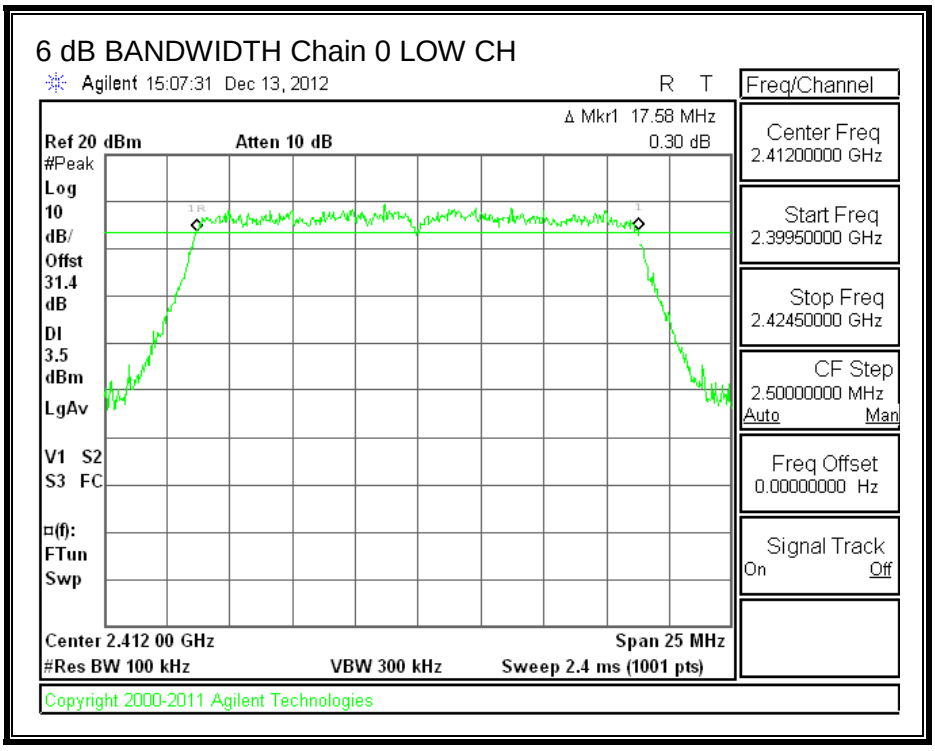
IC RSS-210 A8.2 (a)

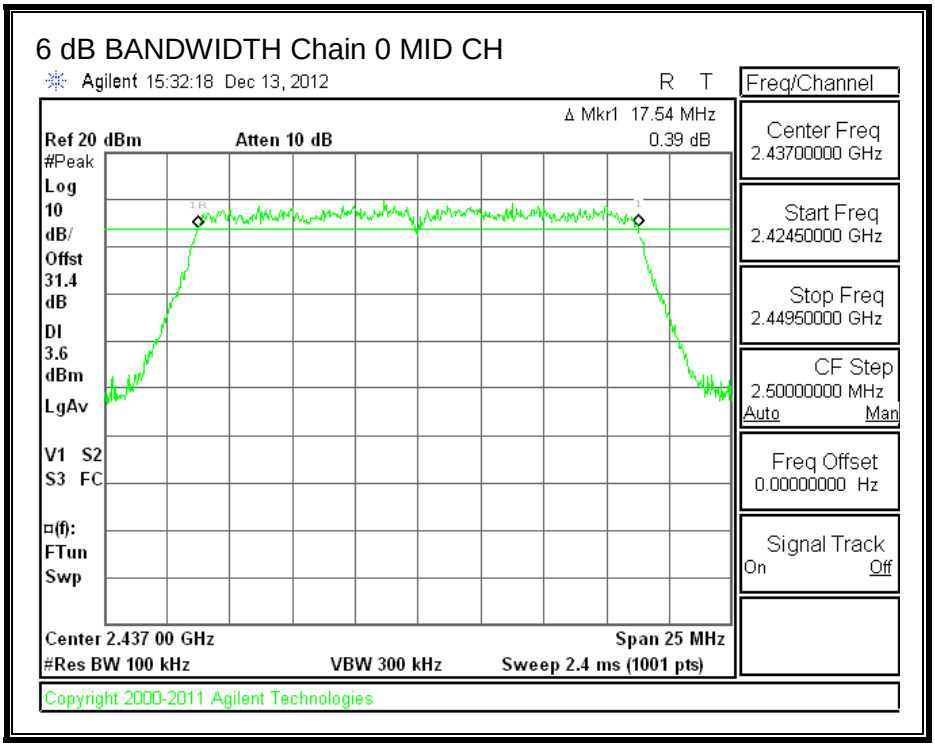
The minimum 6 dB bandwidth shall be at least 500 kHz.

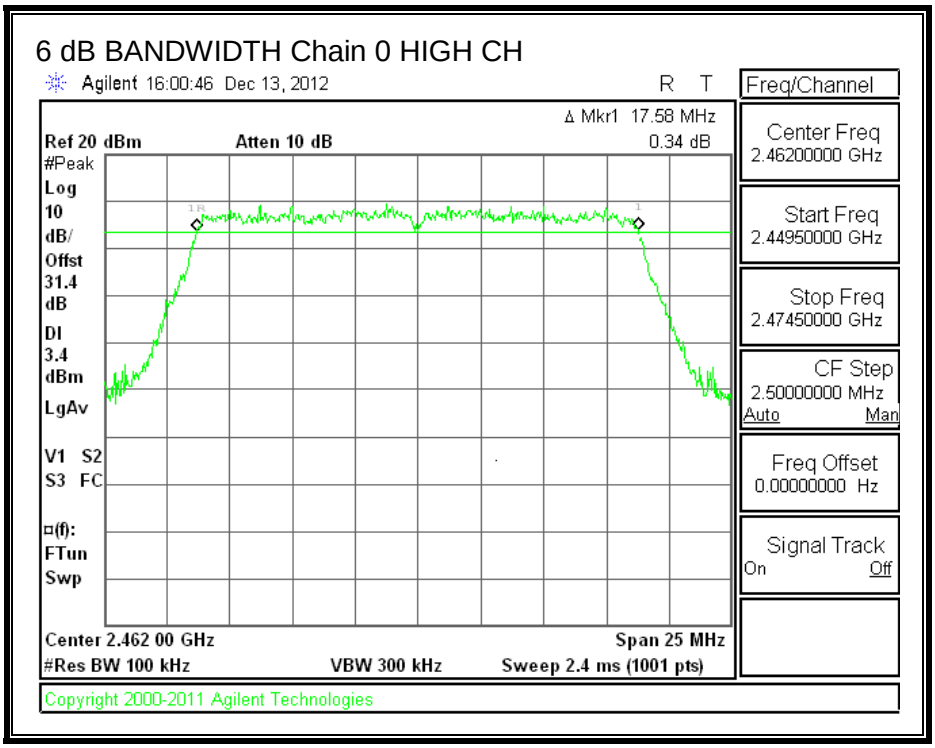
RESULTS

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	2412	17.58	17.71	0.5
Mid	2437	17.54	17.67	0.5
High	2462	17.58	17.71	0.5

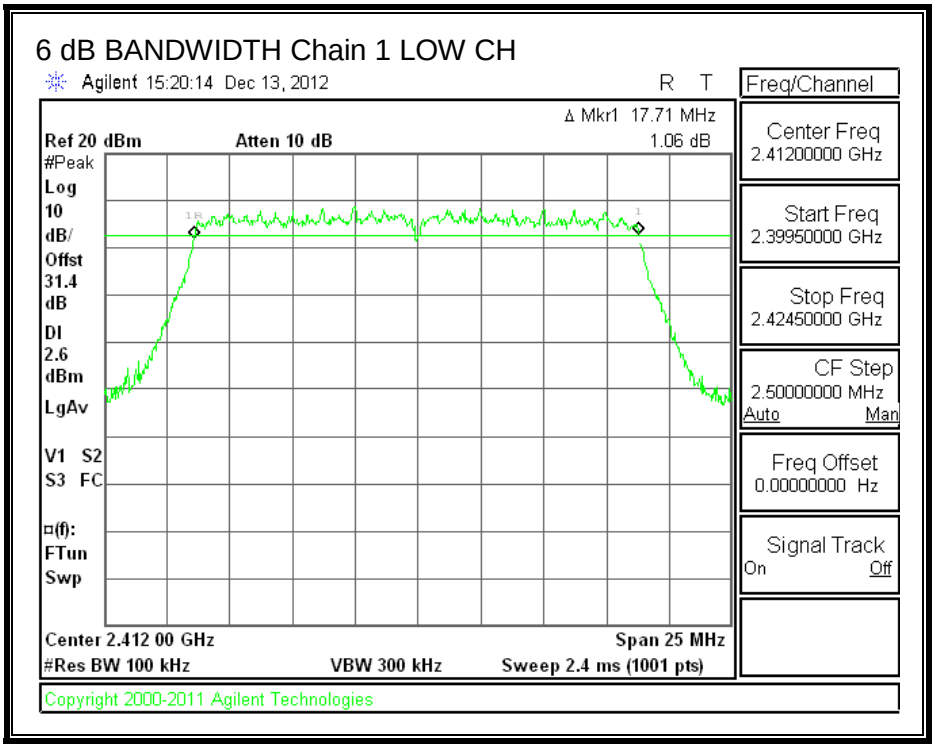
6 dB BANDWIDTH, Chain 0

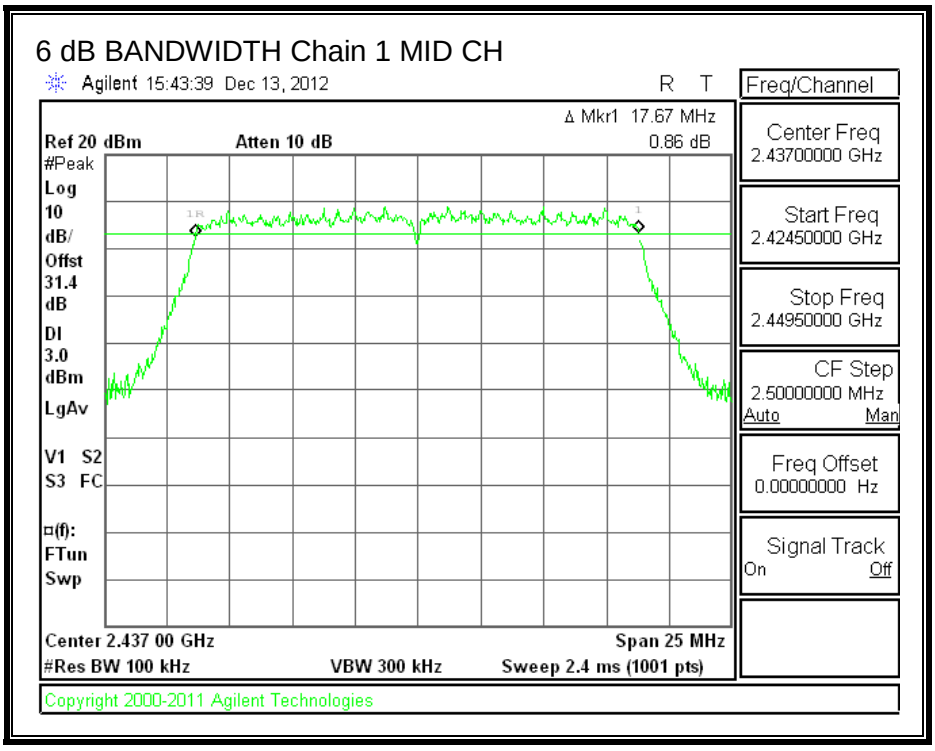


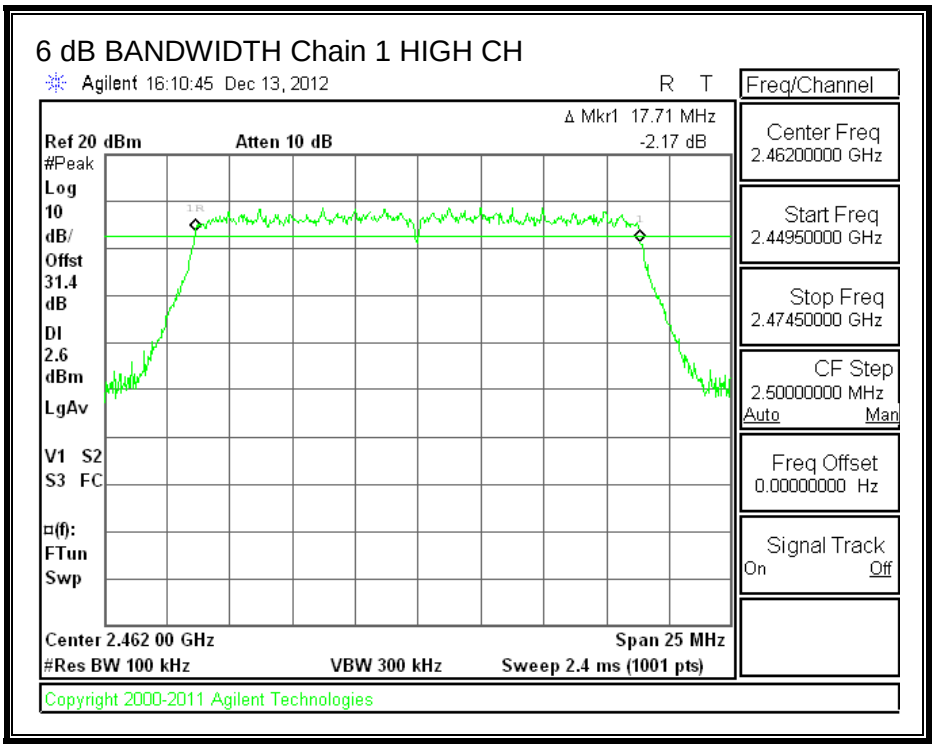




6 dB BANDWIDTH, Chain 1







8.10.2. 99% BANDWIDTH

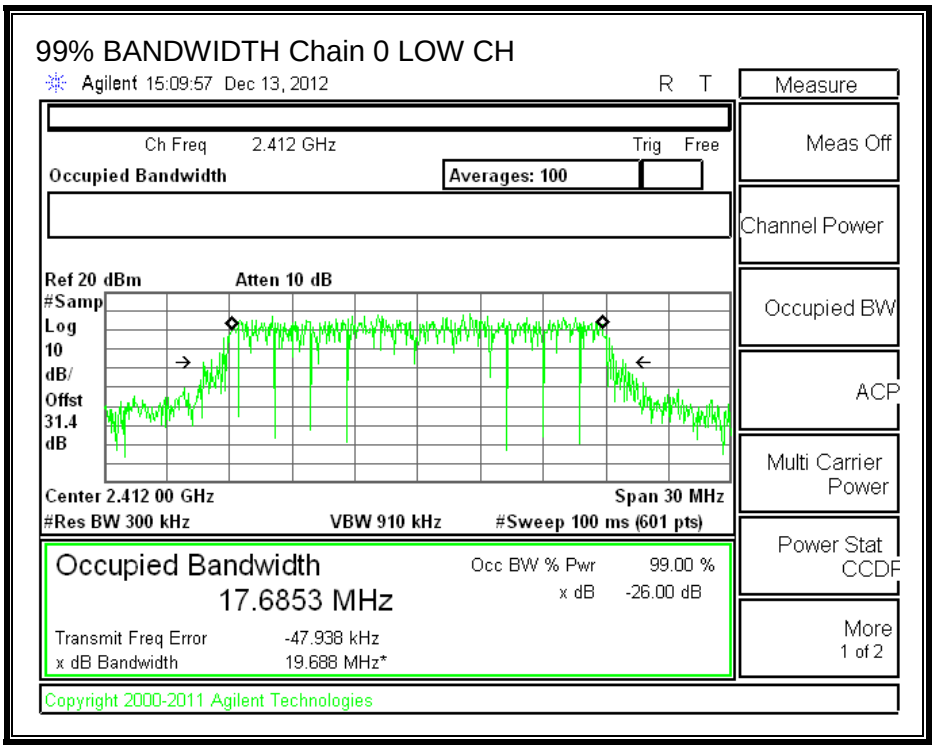
LIMITS

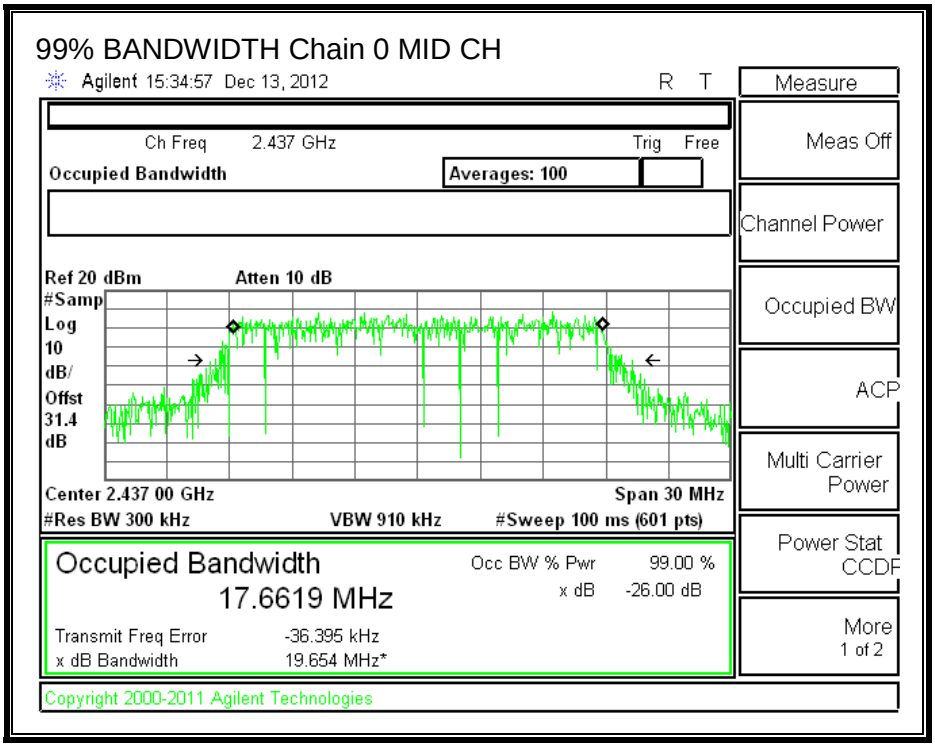
None; for reporting purposes only.

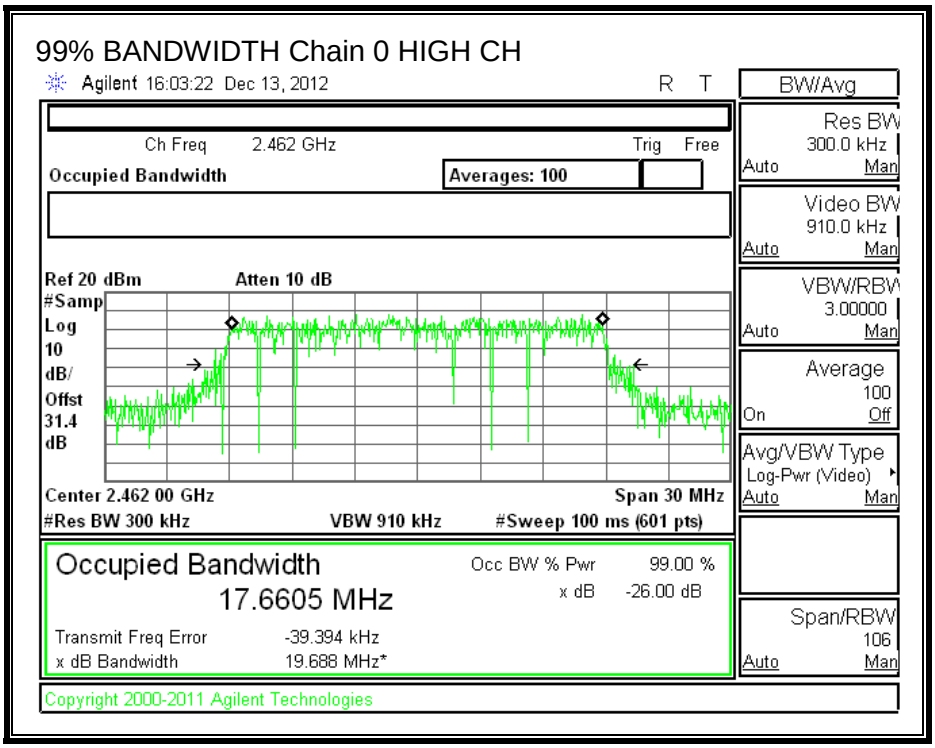
RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	2412	17.6853	17.6850
Mid	2437	17.6619	17.6751
High	2462	17.6605	17.6722

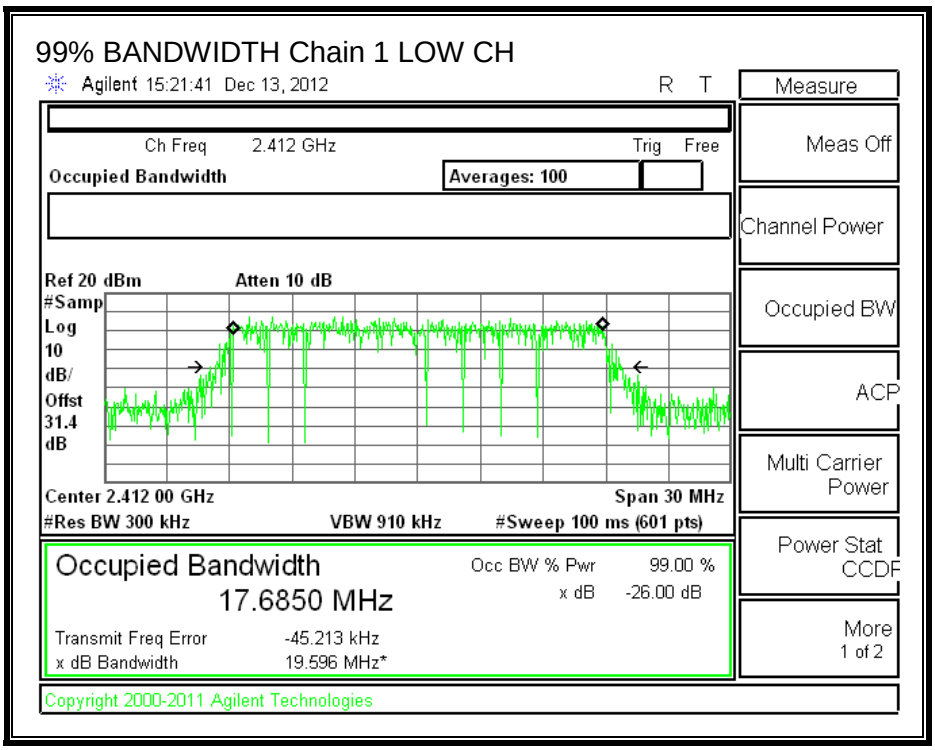
99% BANDWIDTH, Chain 0

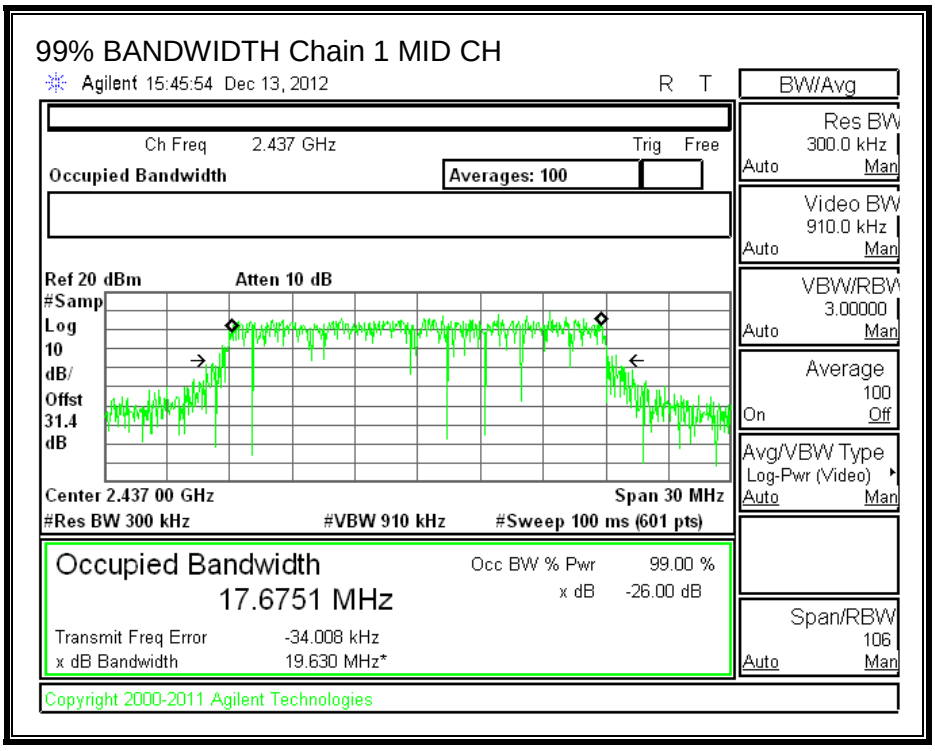


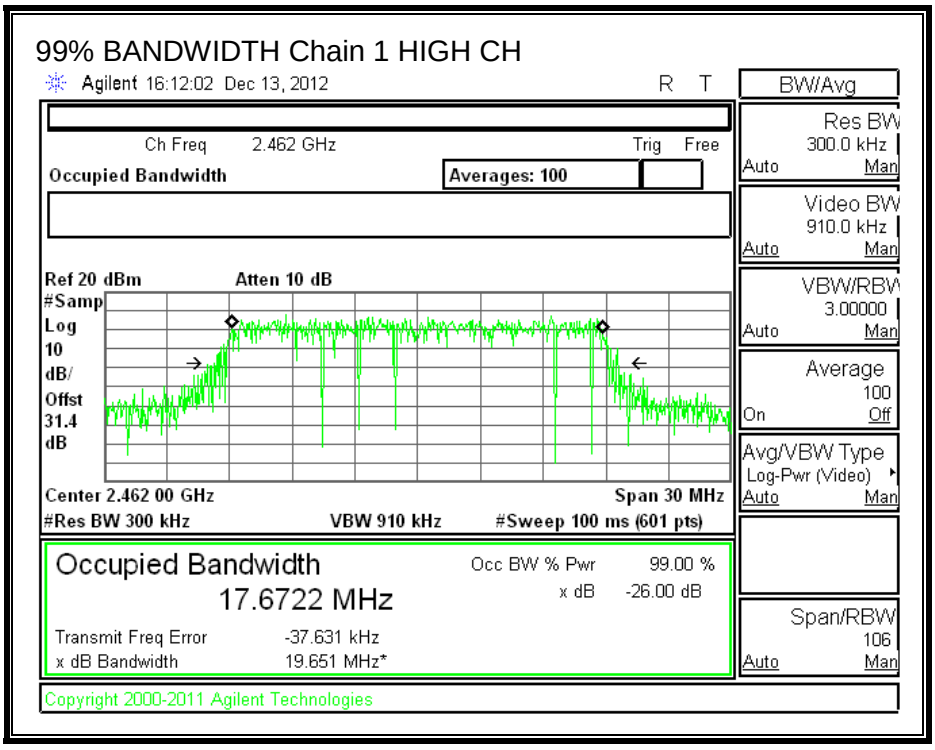




99% BANDWIDTH, Chain 1







8.10.3. OUTPUT AVERAGE POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
3.00	3.10	3.05

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	3.05	30.00	30	36	30.00
Mid	2437	3.05	30.00	30	36	30.00
High	2462	3.05	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margi (dB)
Low1	2412	16.20	16.00	19.11	30.00	-10.89
Low2	2417	17.70	17.50	20.61	30.00	-9.39
Low3	2422	18.60	18.40	21.51	30.00	-8.49
Mid	2437	23.20	23.00	26.11	30.00	-3.89
High3	2452	20.25	20.00	23.14	30.00	-6.86
High2	2457	18.25	18.10	21.19	30.00	-8.81
High1	2462	16.60	16.40	19.51	30.00	-10.49

8.10.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247

IC RSS-210 A8.2

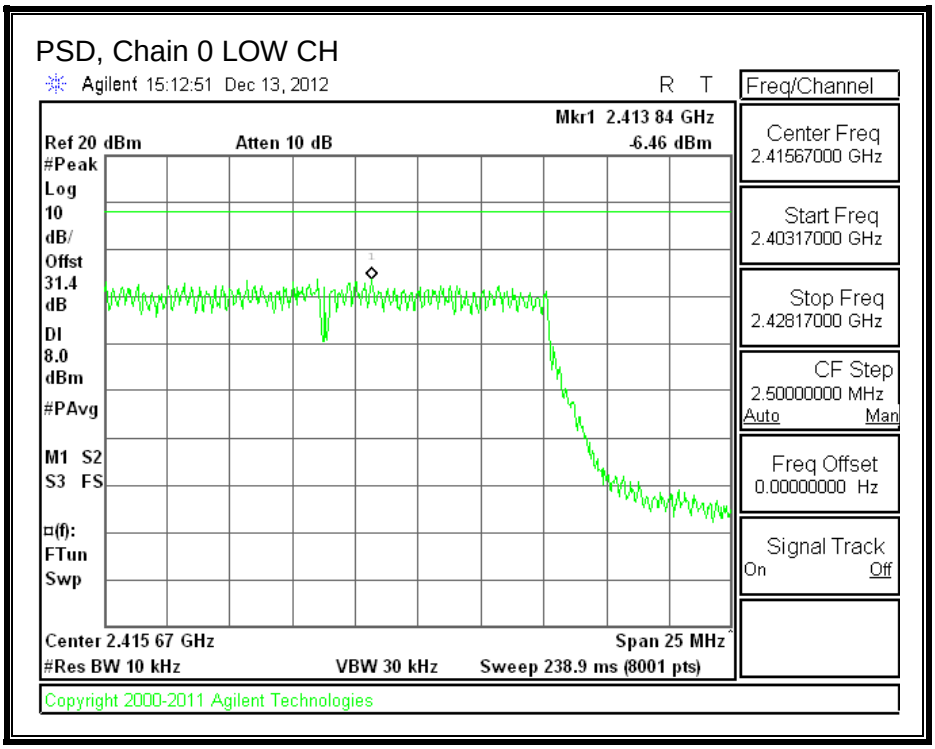
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

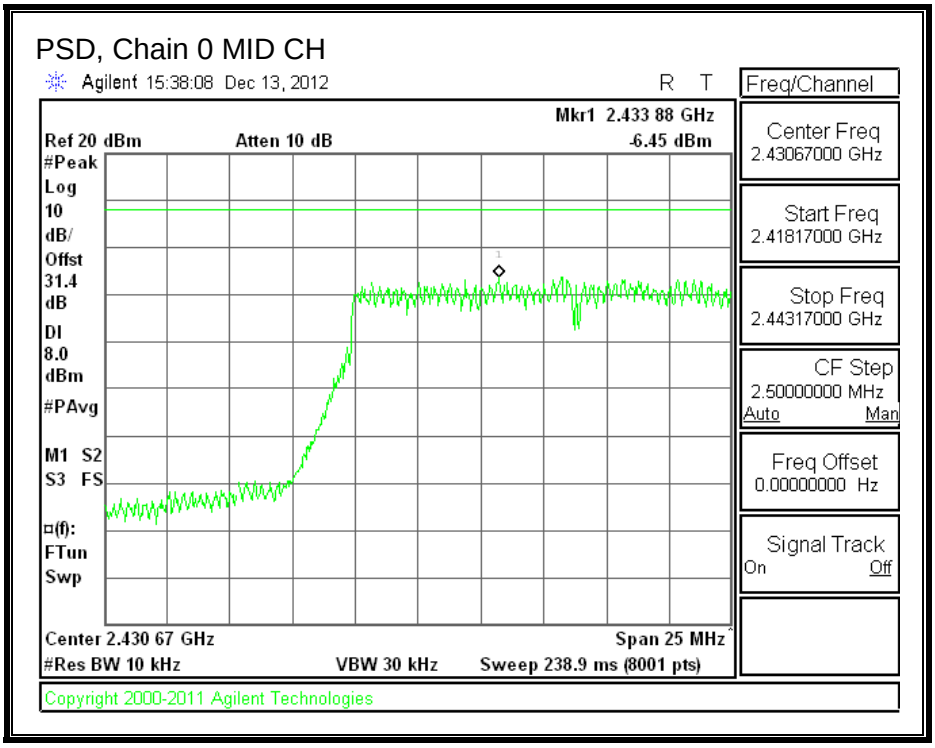
RESULTS

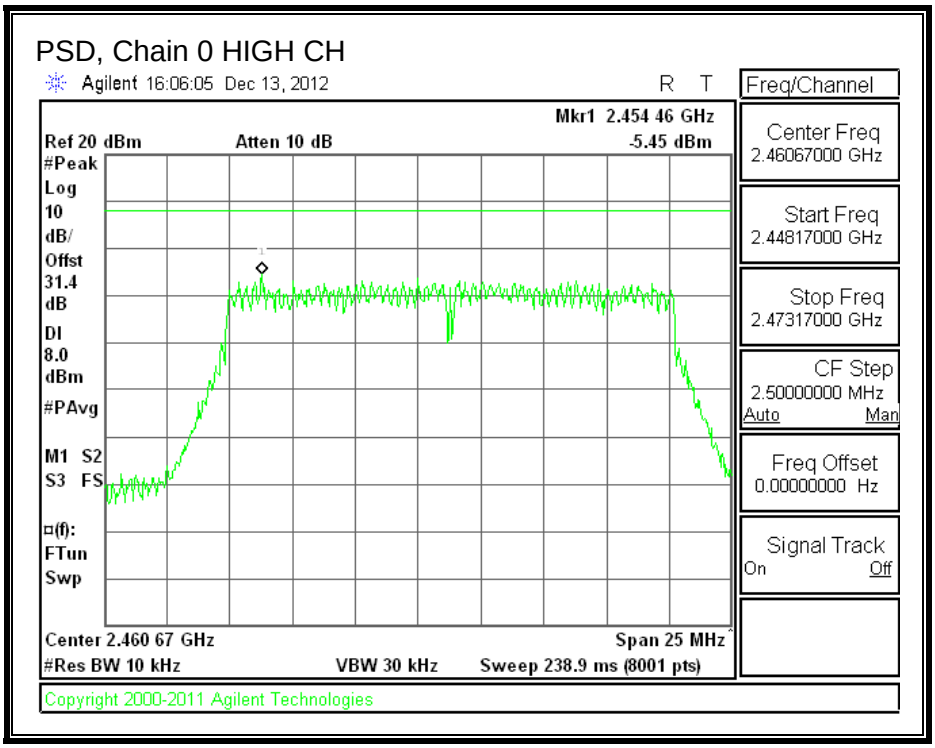
PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-6.46	-6.91	-3.67	8.0	-11.7
Mid	2437	-6.45	-6.58	-3.50	8.0	-11.5
High	2462	-5.45	-5.48	-2.45	8.0	-10.5

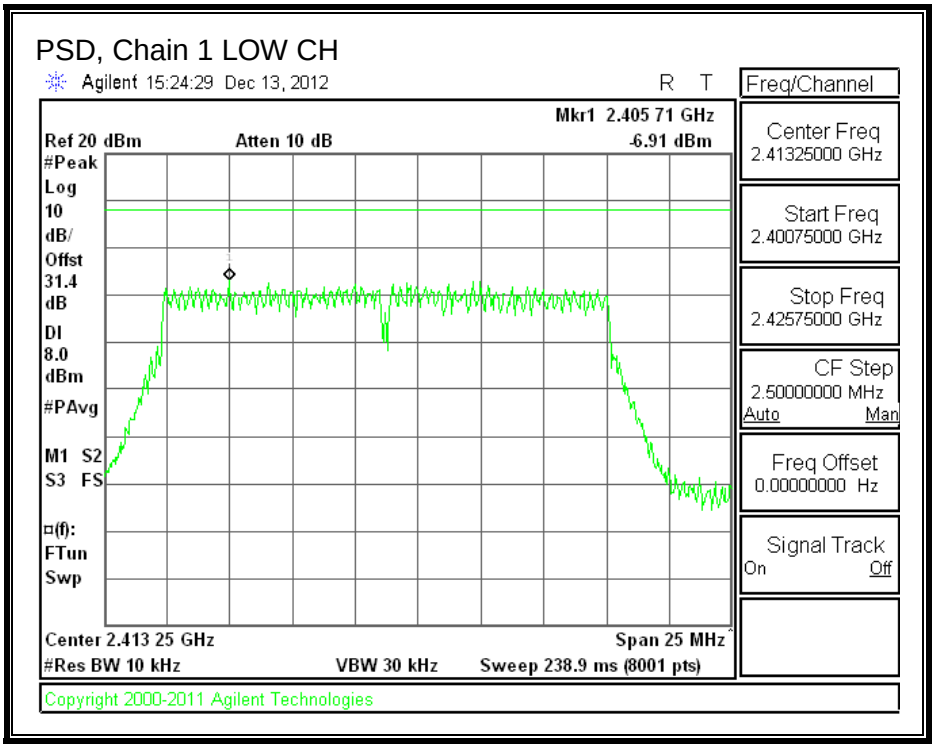
PSD, Chain 0



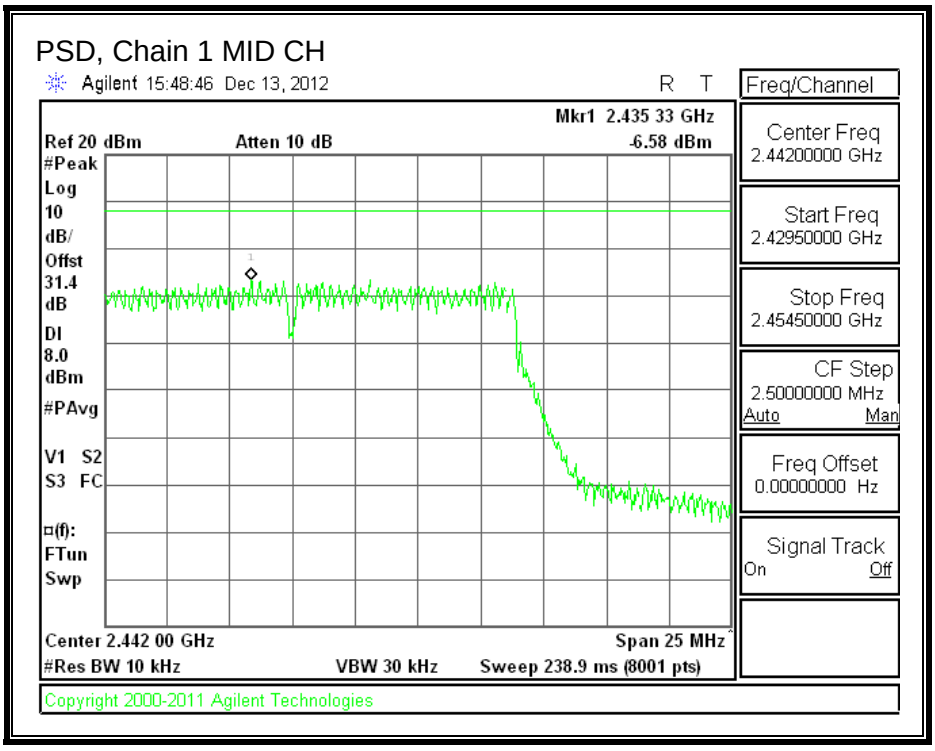




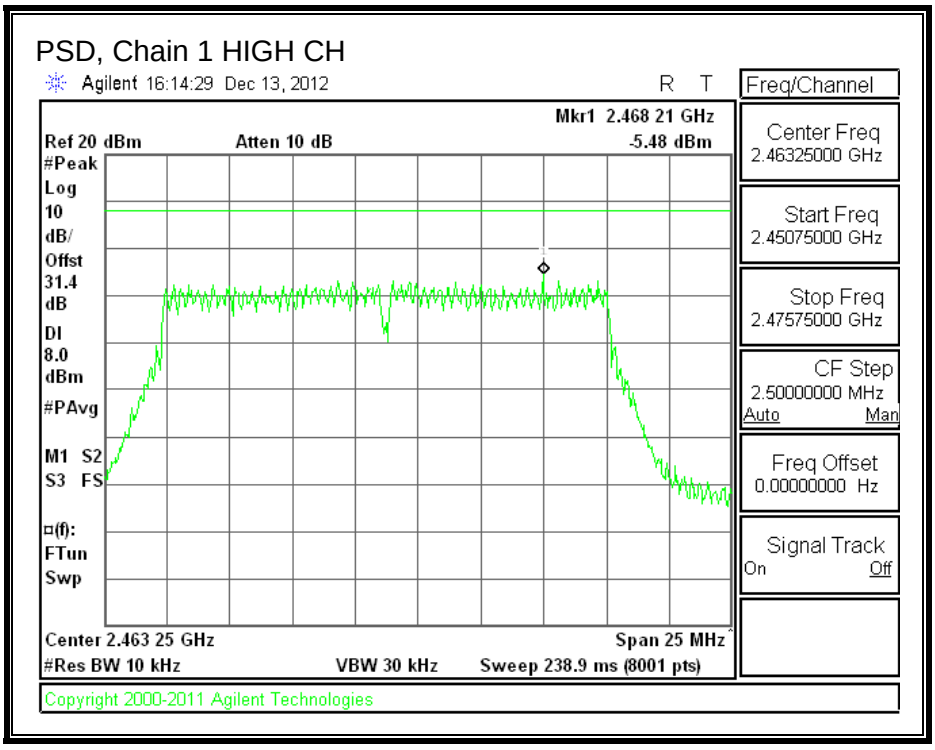
PSD, Chain 1



PSD, Chain 1 MID CH



PSD, Chain 1 HIGH CH



8.10.5. OUT-OF-BAND EMISSIONS

LIMITS

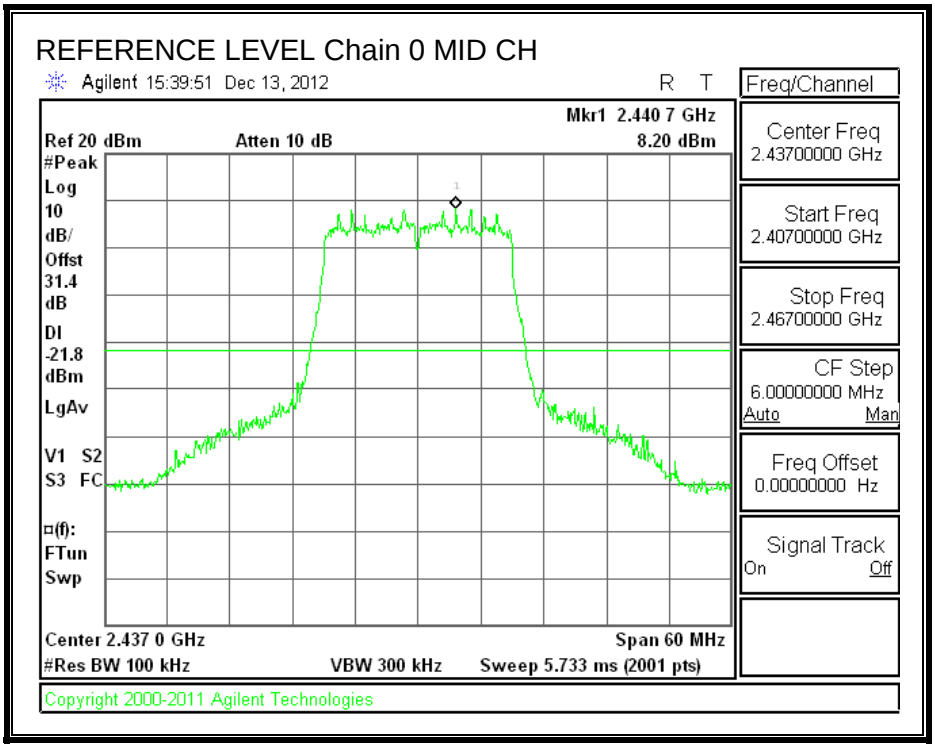
FCC §15.247 (d)

IC RSS-210 A8.5

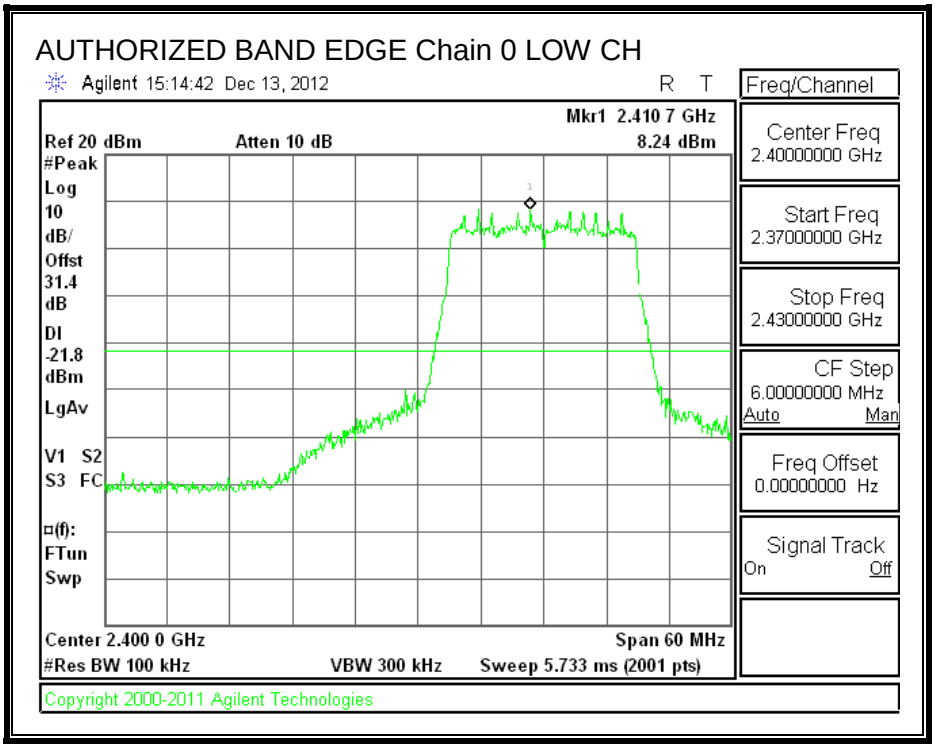
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

RESULTS

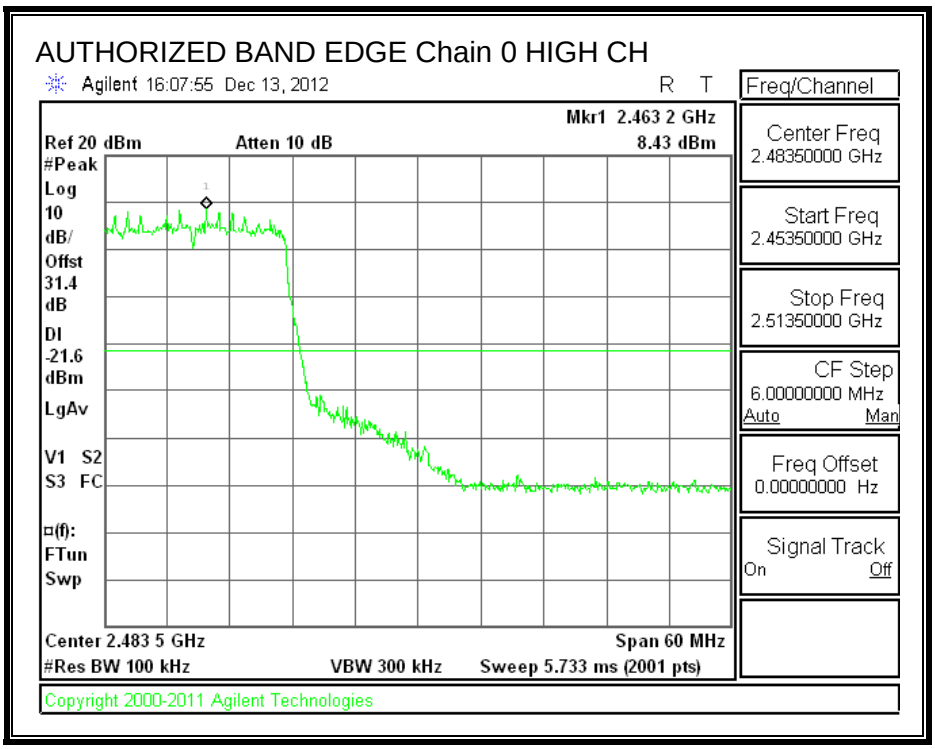
IN-BAND REFERENCE LEVEL, Chain 0



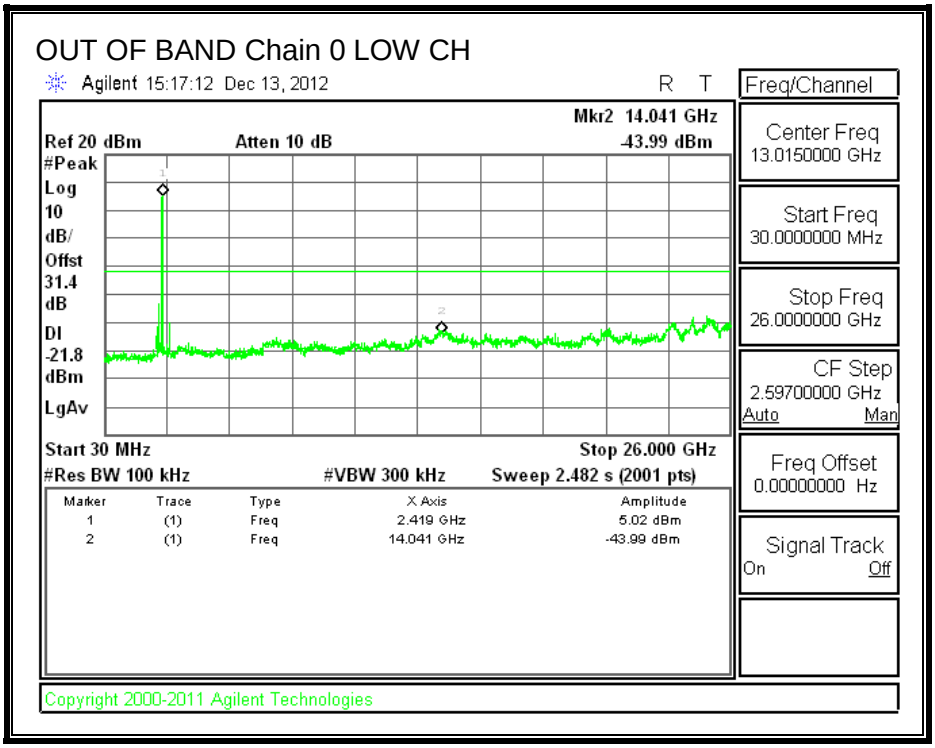
LOW CHANNEL BANDEDGE, Chain 0

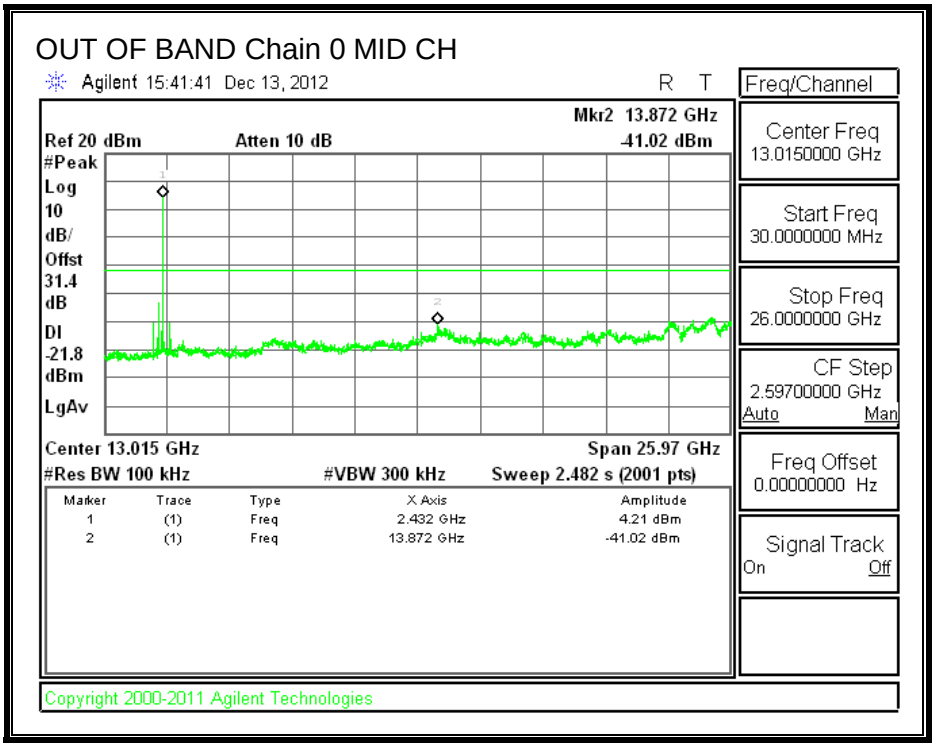


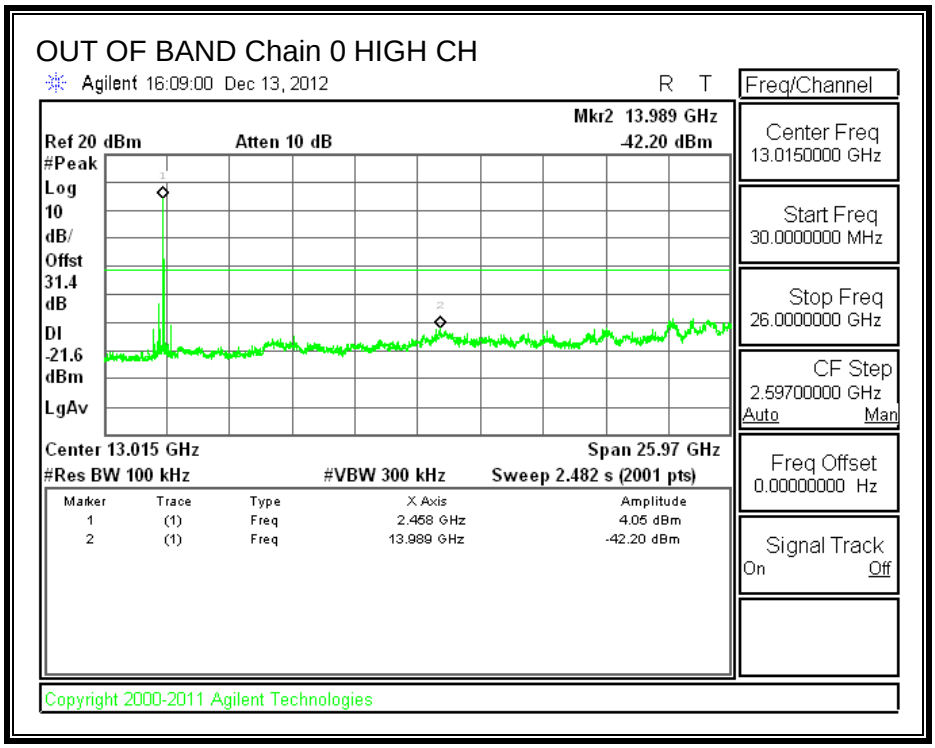
HIGH CHANNEL BANDEDGE, Chain 0



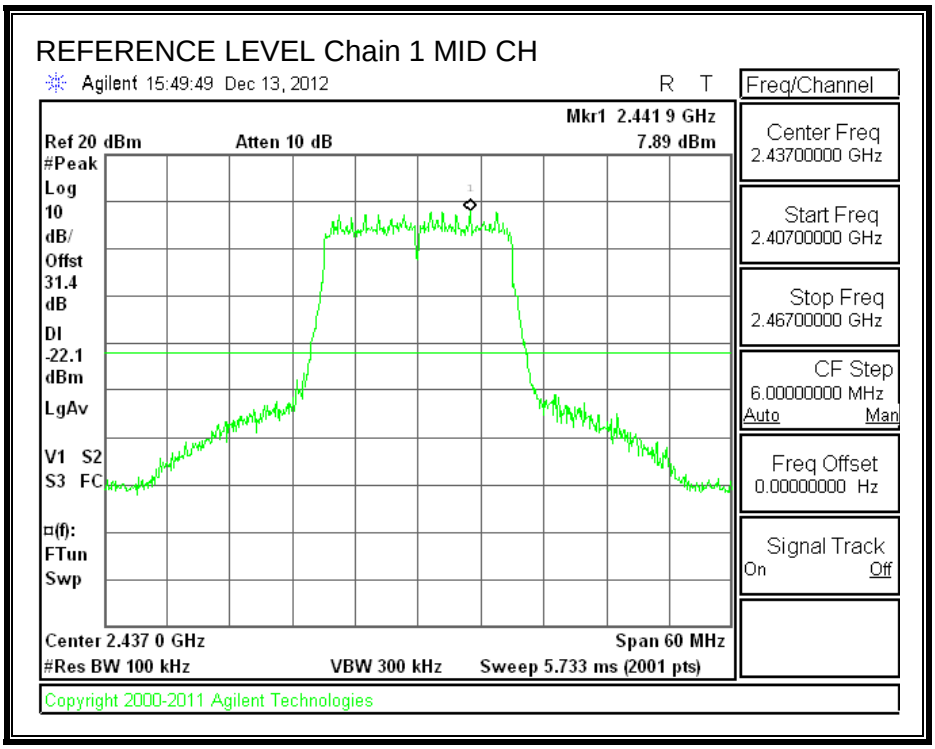
OUT-OF-BAND EMISSIONS, Chain 0



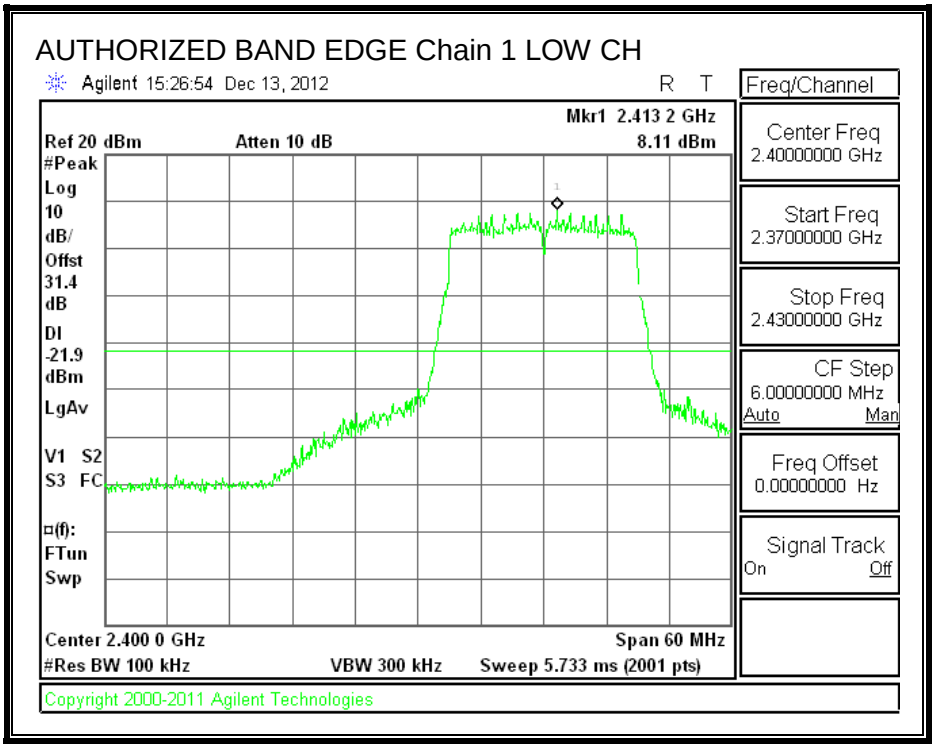




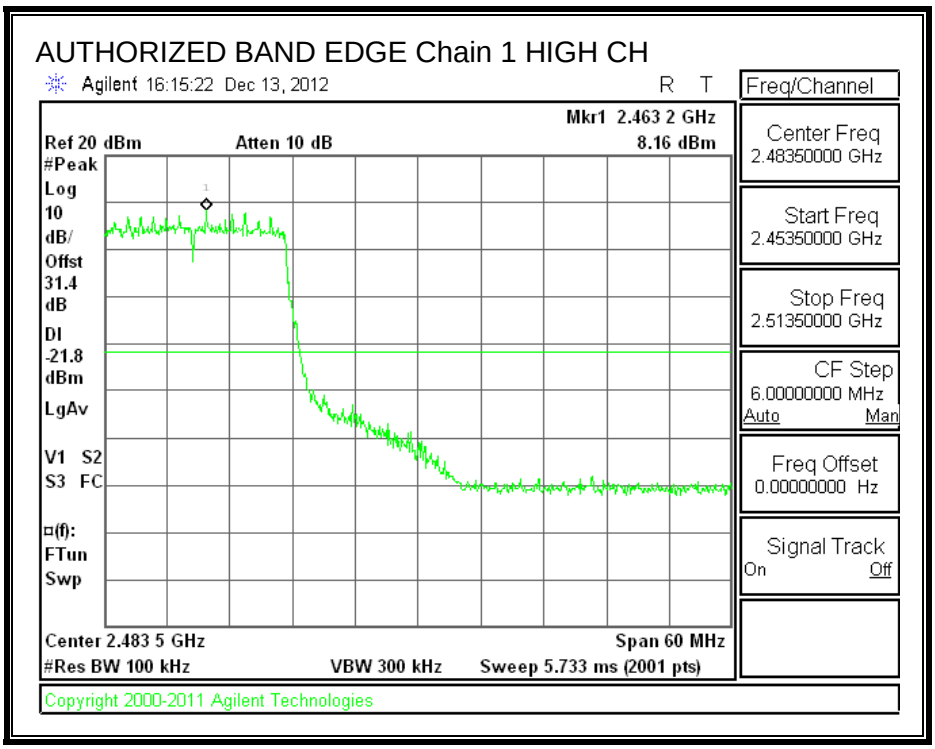
IN-BAND REFERENCE LEVEL, Chain 1



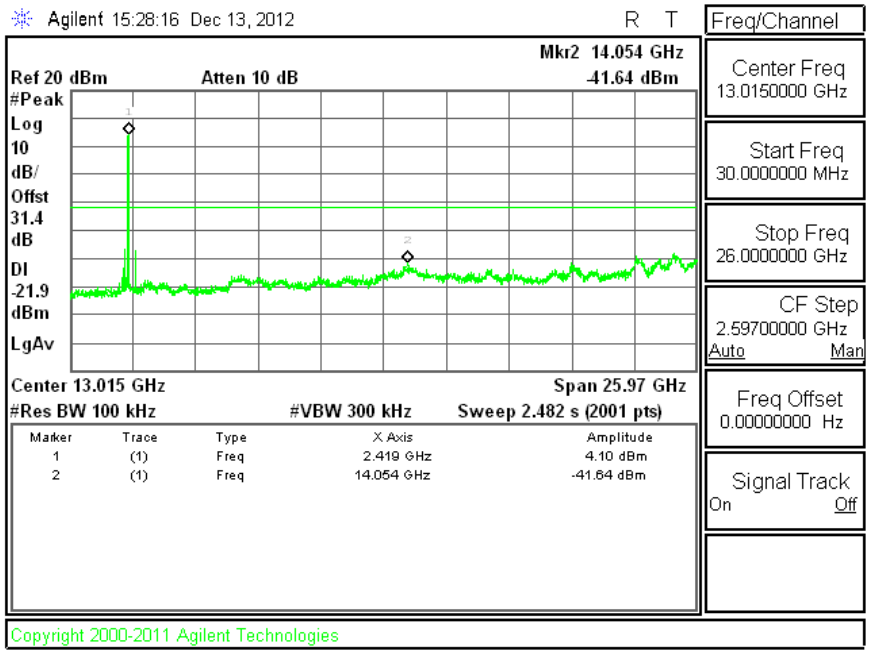
LOW CHANNEL BANDEDGE, Chain 1



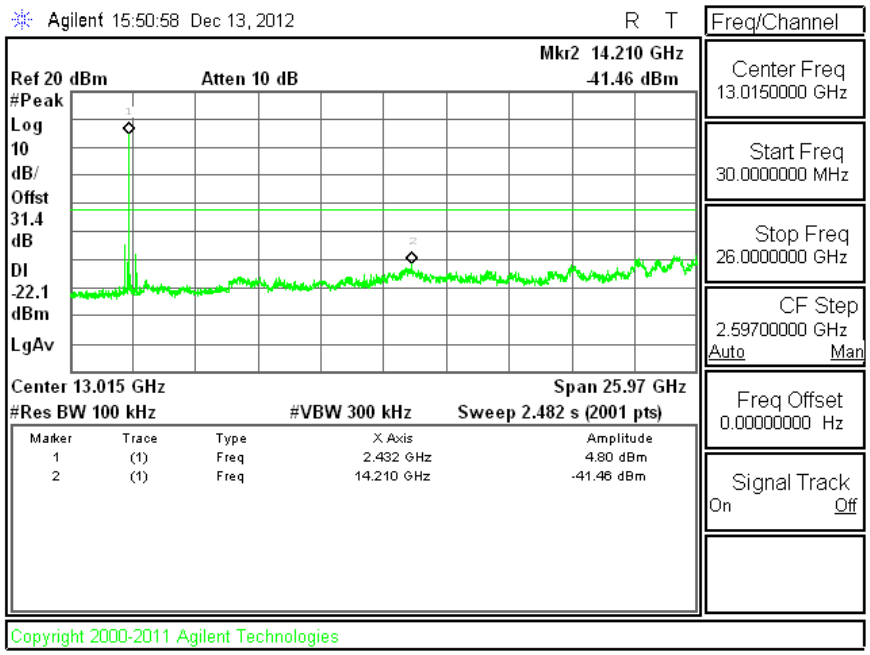
HIGH CHANNEL BANDEDGE, Chain 1

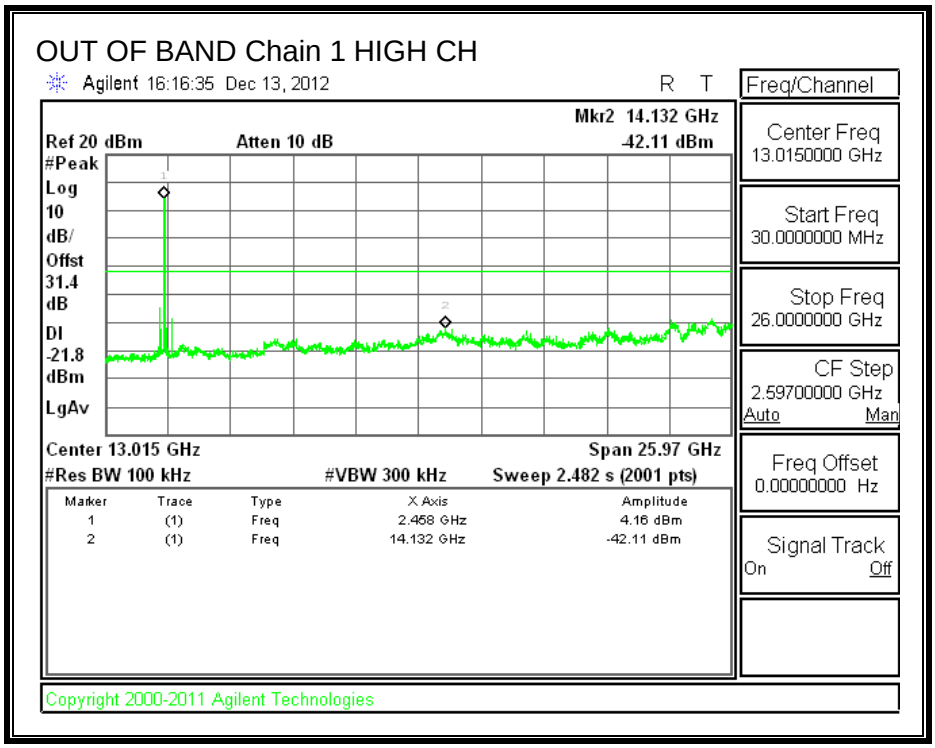


OUT OF BAND Chain 1 LOW CH



OUT OF BAND Chain 1 MID CH





8.11. 802.11n HT20 CDD 3TX MODE IN THE 2.4 GHz BAND

8.11.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

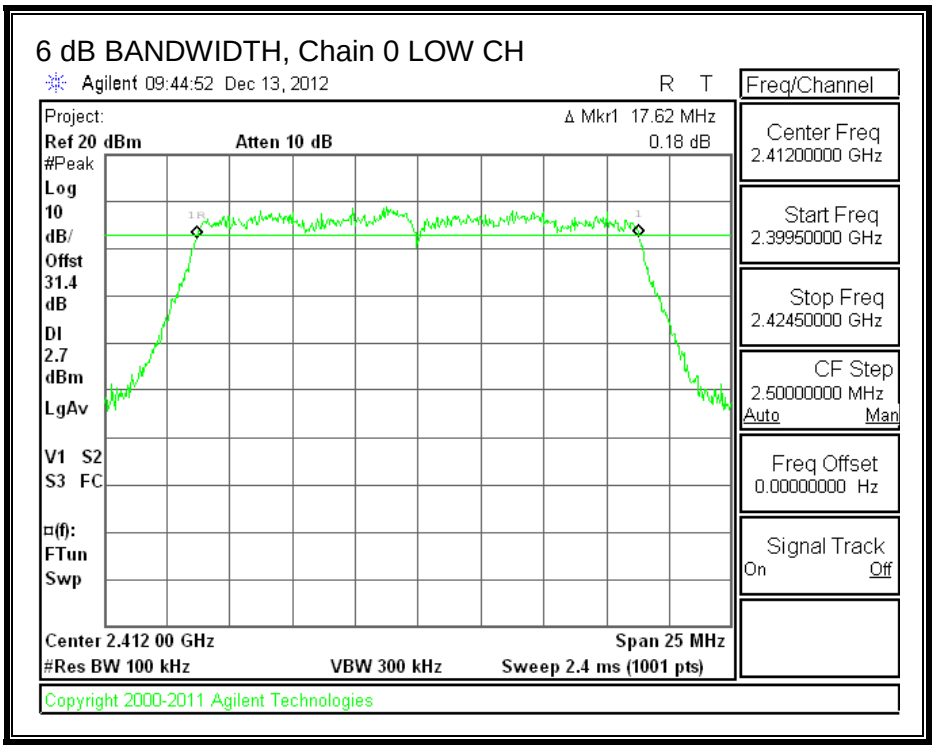
TEST PROCEDURE

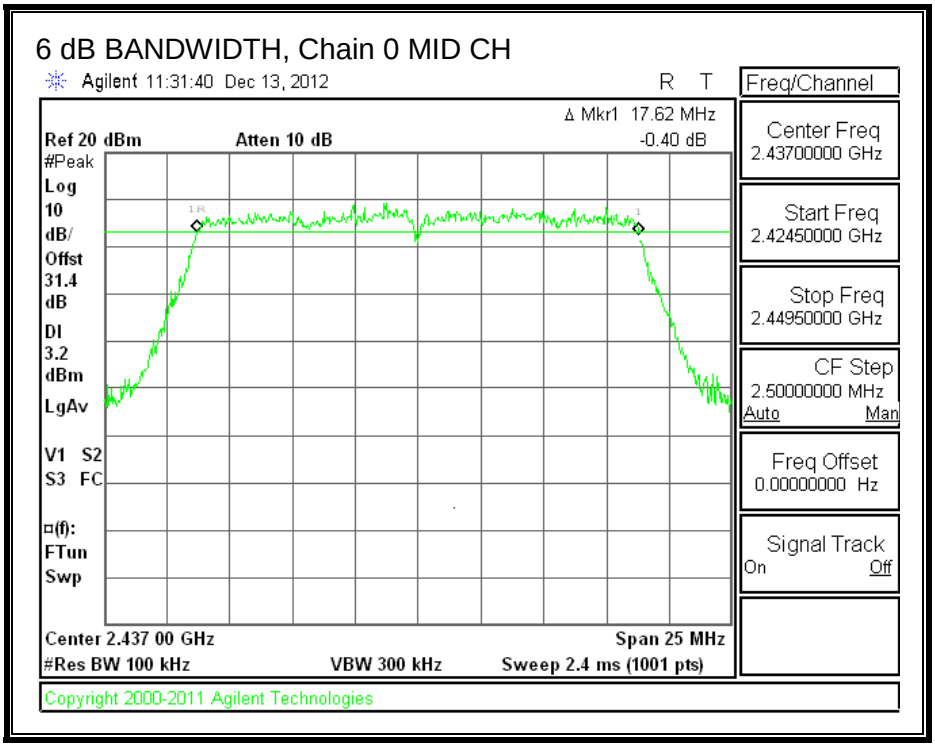
The transmitter output is connected to a spectrum analyzer with the RBW set between 1% and 5% of the EBW, the VBW >= 3 x RBW, peak detector and max hold.

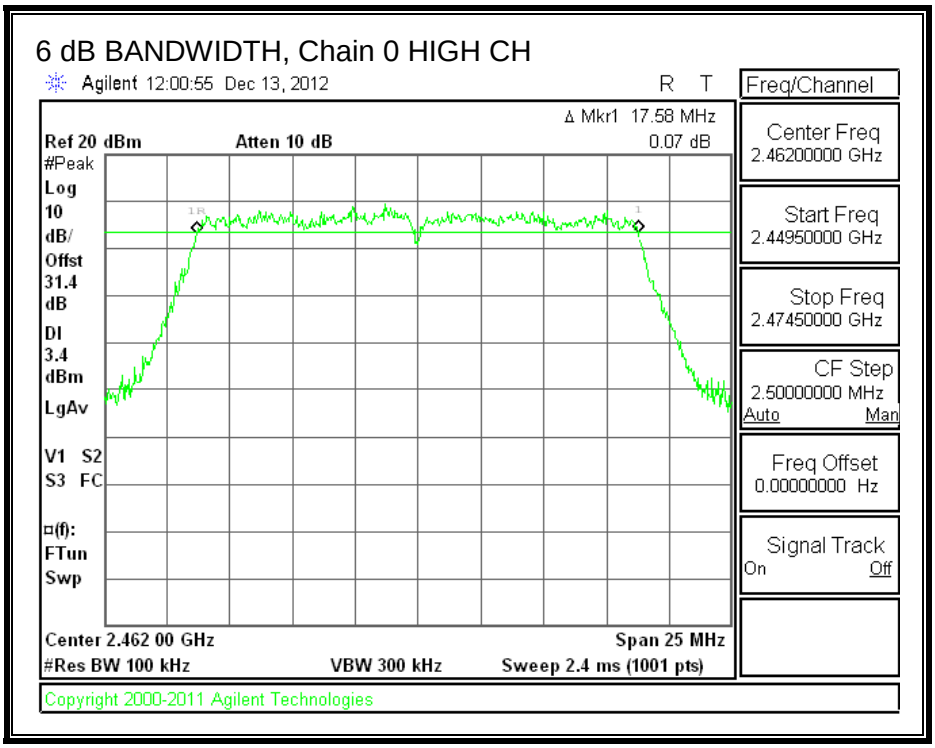
RESULTS

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	6 dB BW Chain 2 (MHz)	Minimum Limit (MHz)
Low	2412	17.62	17.62	17.67	0.5
Mid	2437	17.62	17.62	17.67	0.5
High	2462	17.58	17.67	17.67	0.5

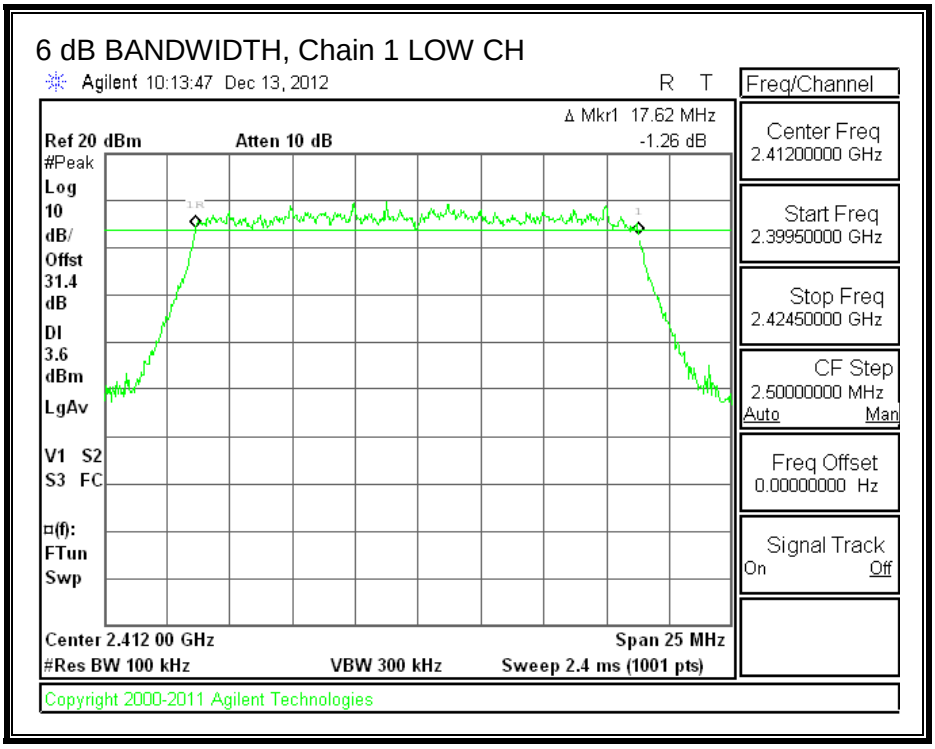
6 dB BANDWIDTH, Chain 0

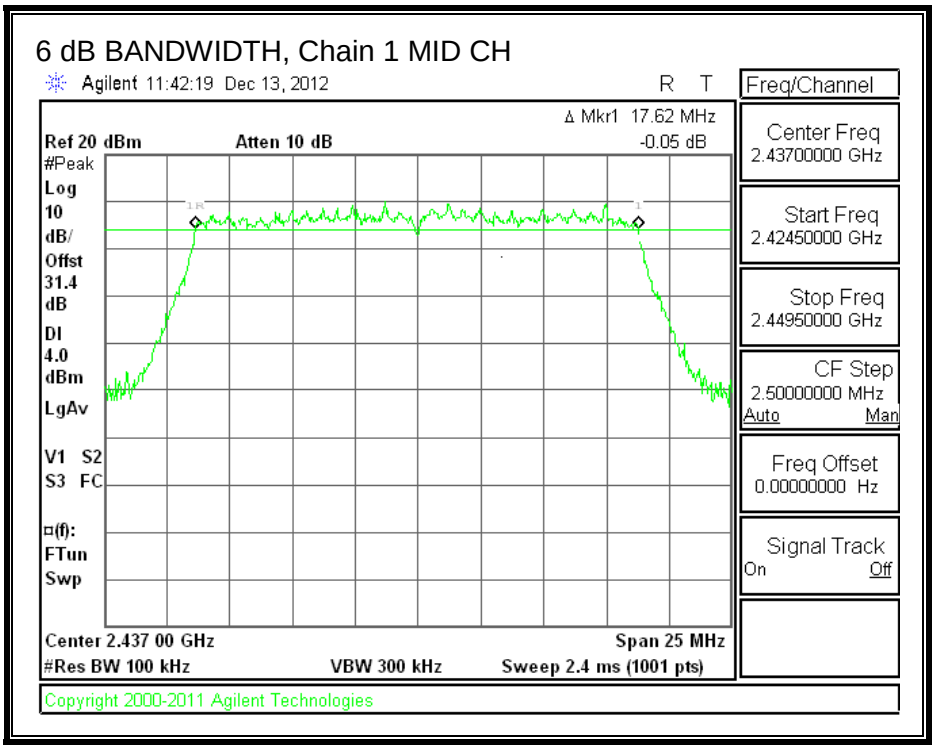


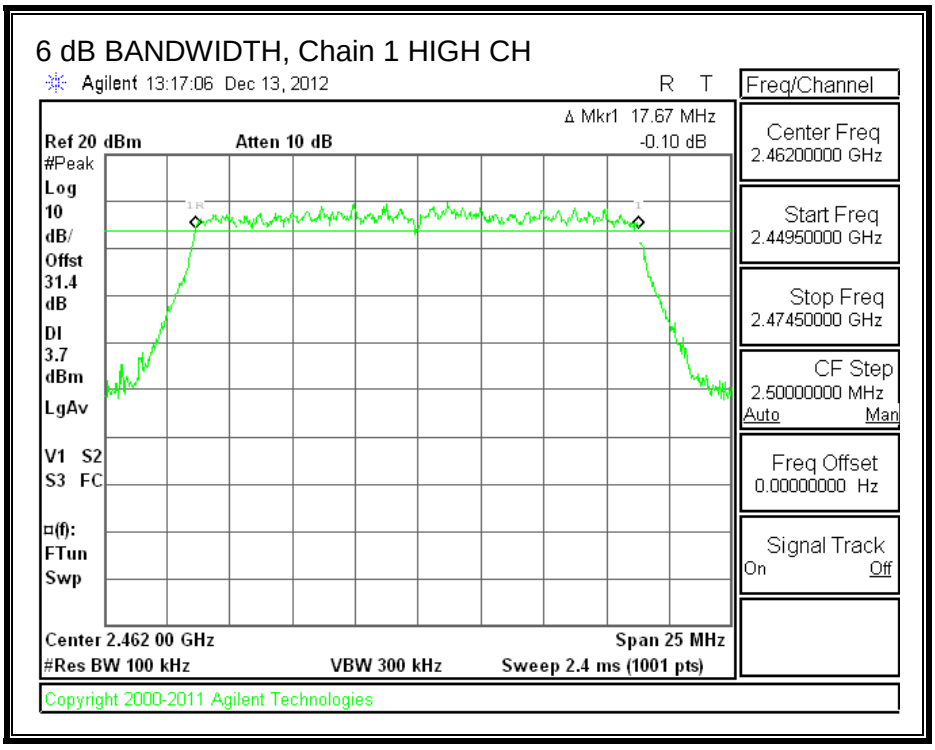




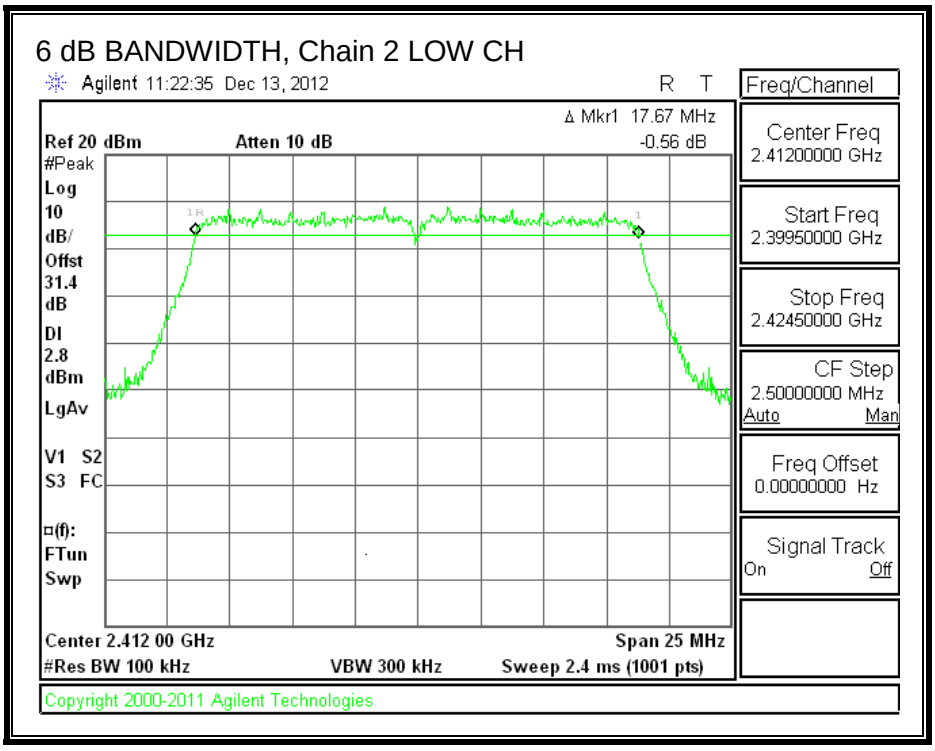
6 dB BANDWIDTH, Chain 1

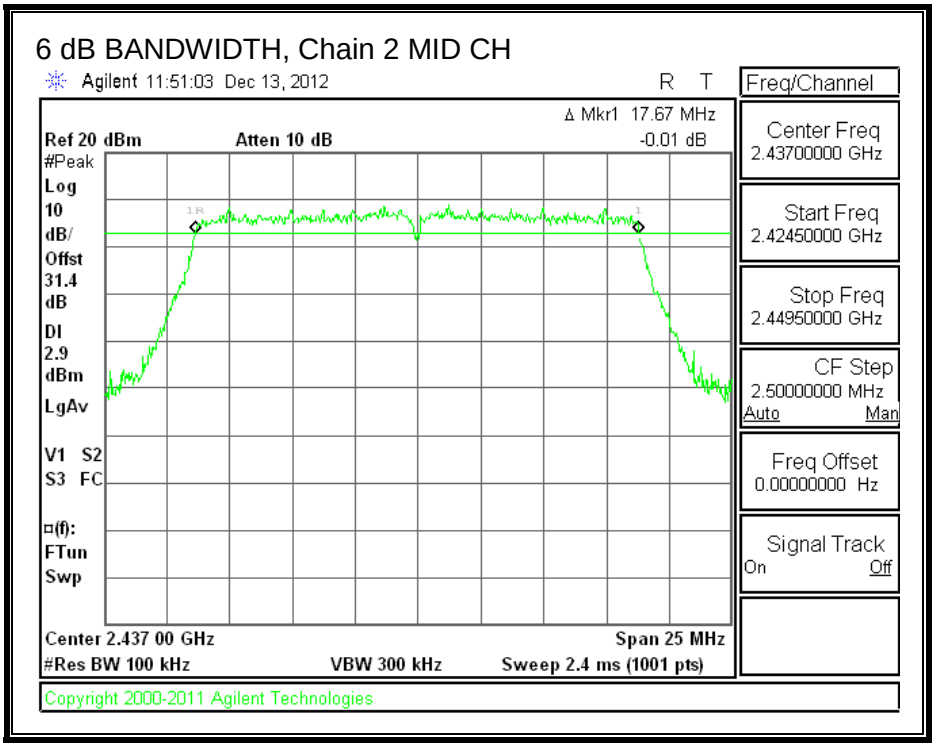


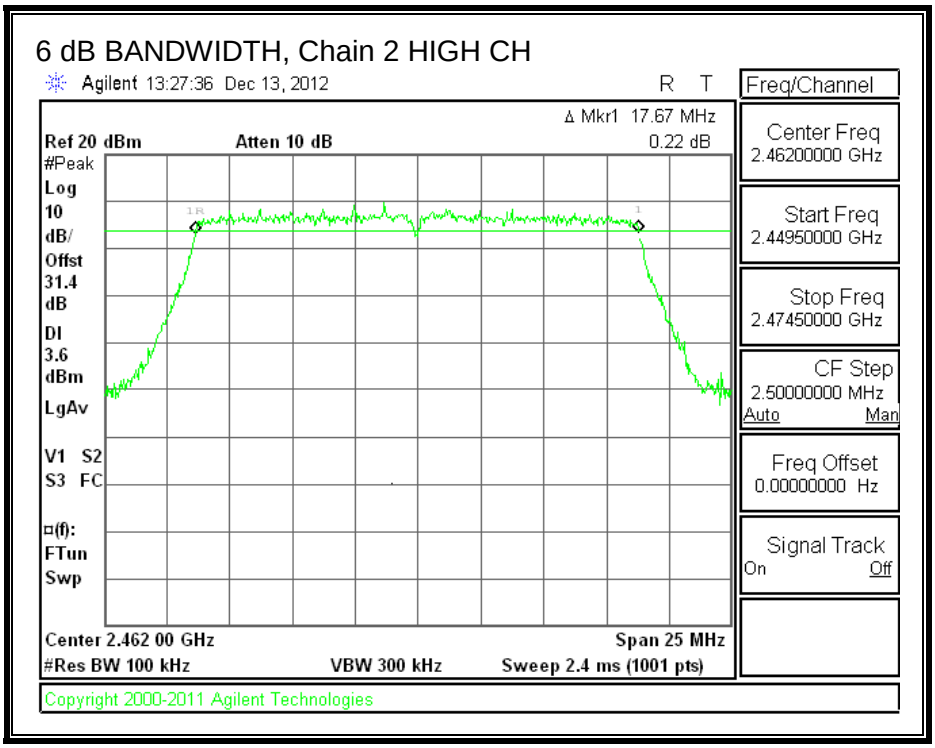




6 dB BANDWIDTH, Chain 2







8.11.2. 99% BANDWIDTH

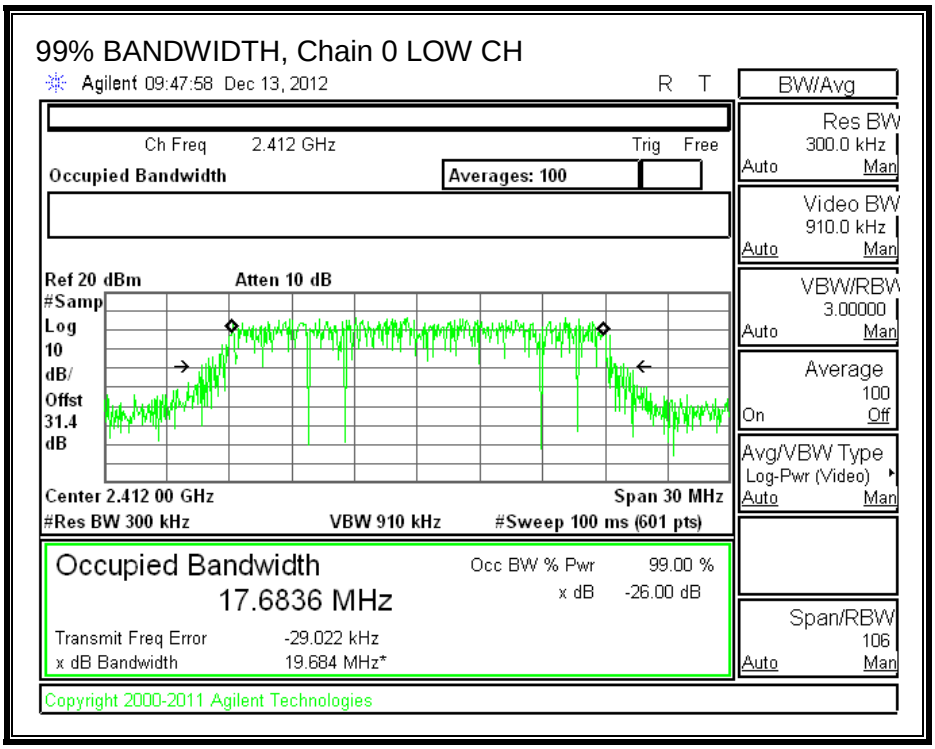
LIMITS

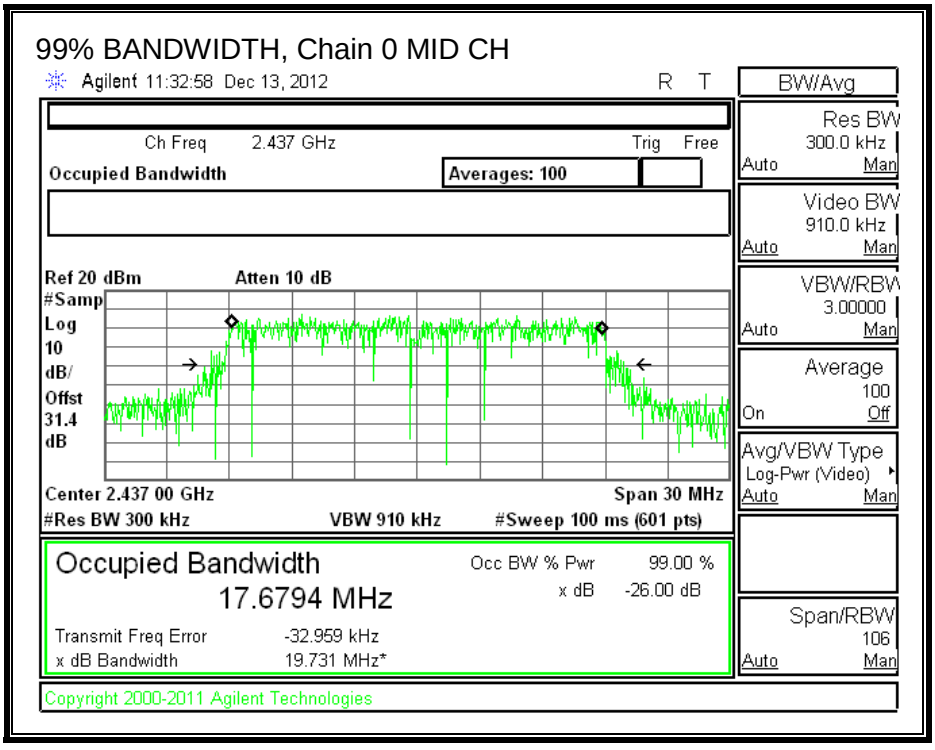
None; for reporting purposes only.

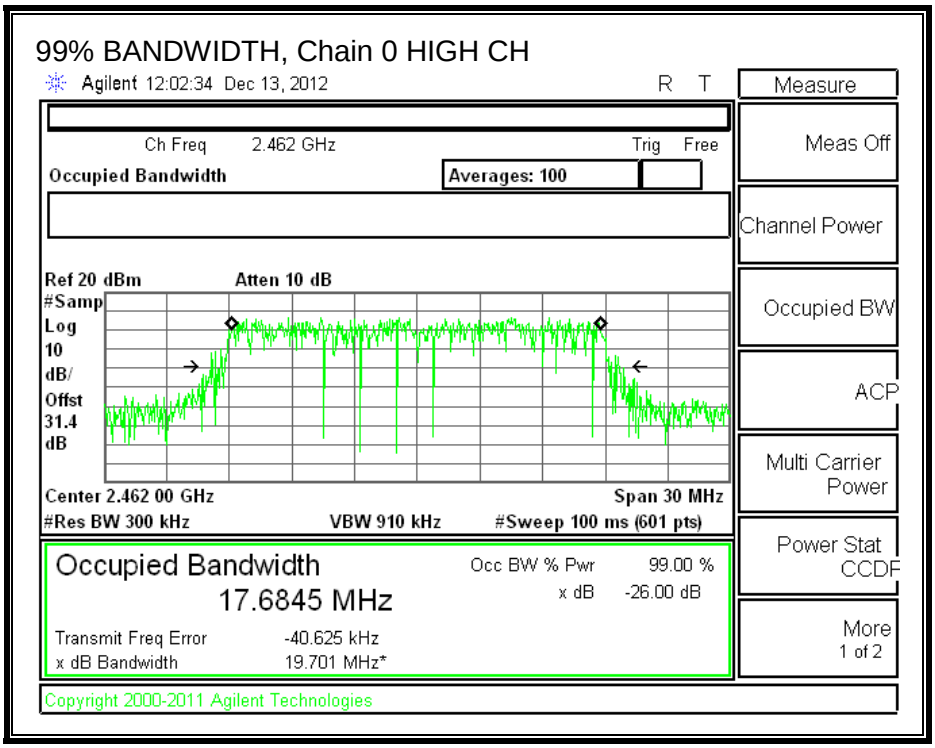
RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Low	2412	17.6836	17.6544	17.6840
Mid	2437	17.6794	17.6782	17.6820
High	2462	17.6845	17.6792	17.6895

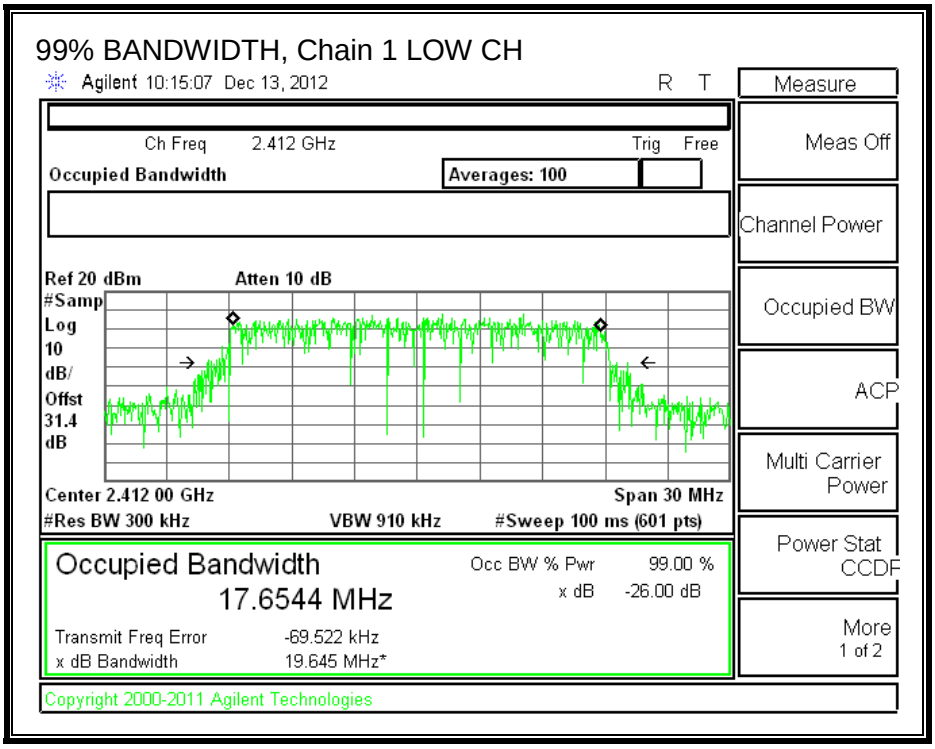
99% BANDWIDTH, Chain 0

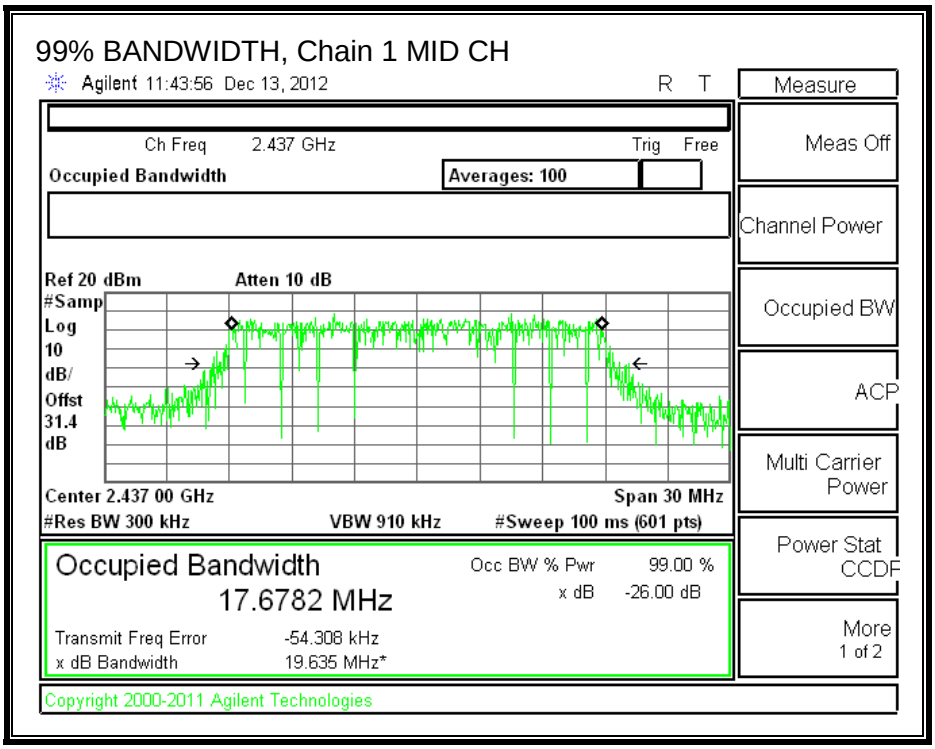


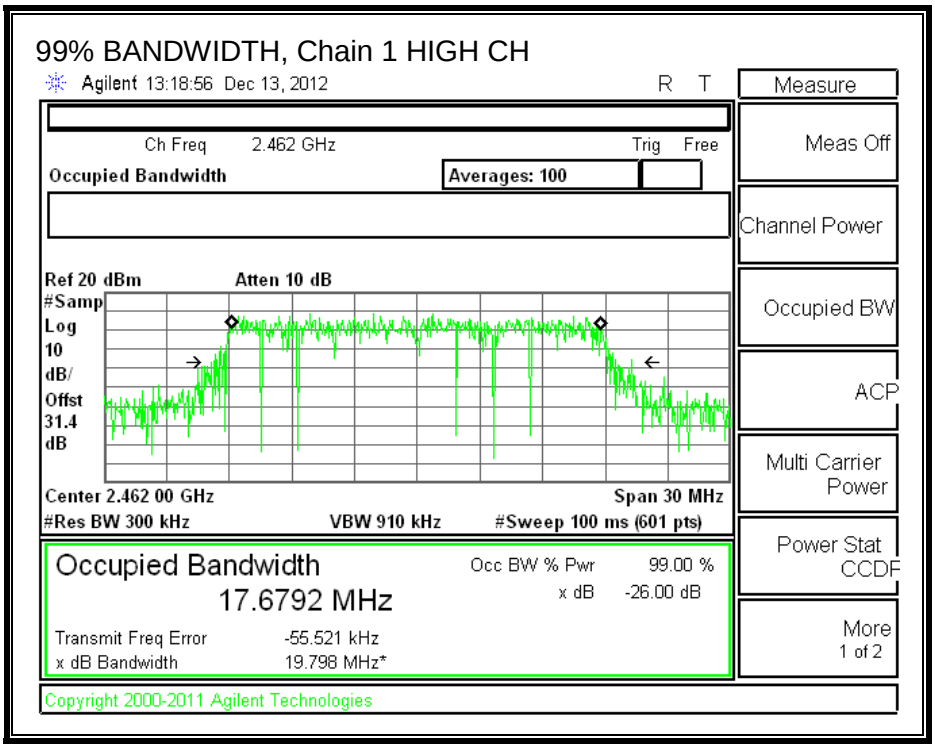




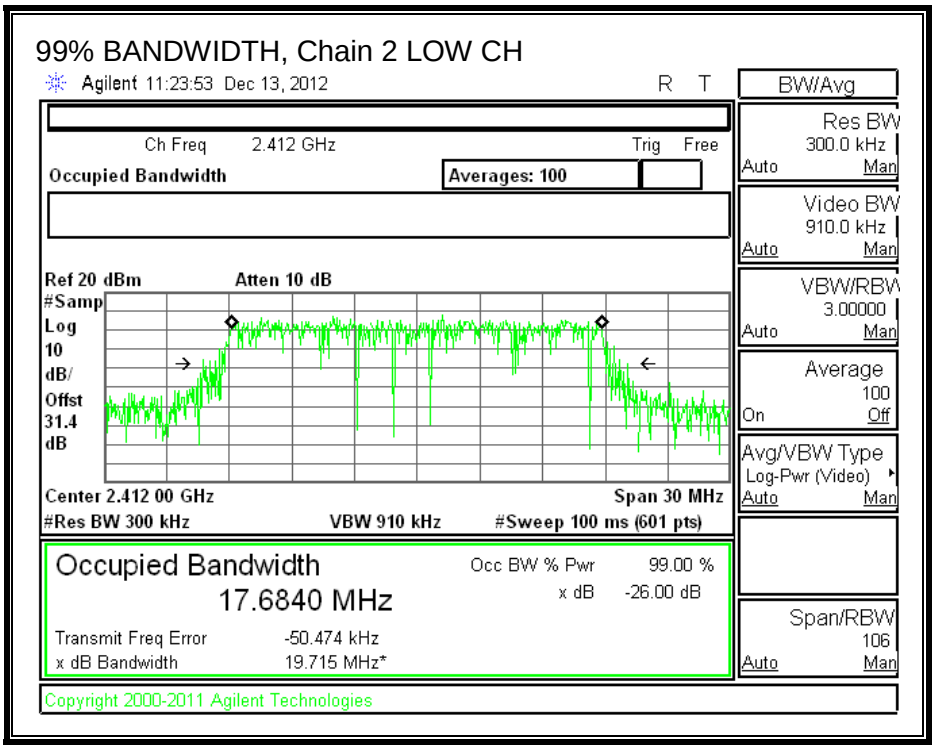
99% BANDWIDTH, Chain 1

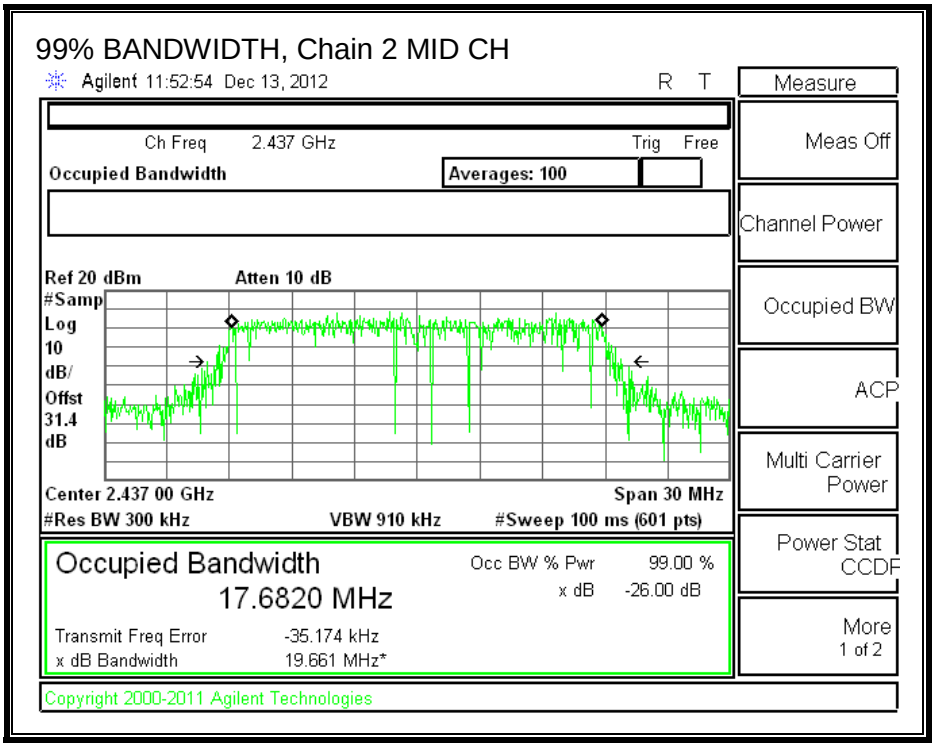


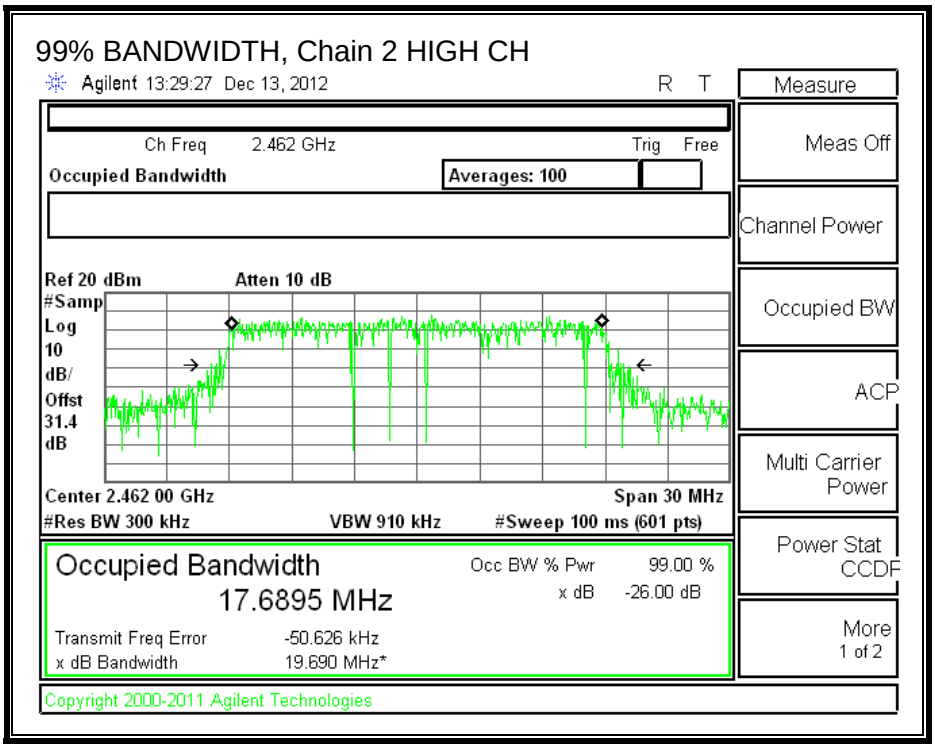




99% BANDWIDTH, Chain 2







8.11.3. OUTPUT AVERAGE POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
3.00	3.00	3.10	3.03

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	3.03	30.00	30	36	30.00
Mid	2437	3.03	30.00	30	36	30.00
High	2462	3.03	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low1	2412	14.90	15.50	15.30	20.01	30.00	-9.99
Low2	2417	15.90	16.30	16.15	20.89	30.00	-9.11
Low3	2422	16.90	17.25	17.05	21.84	30.00	-8.16
Mid	2437	21.90	22.50	22.30	27.01	30.00	-2.99
High3	2452	18.45	18.86	18.60	23.41	30.00	-6.59
High2	2457	16.90	17.30	17.05	21.86	30.00	-8.14
High1	2462	15.00	15.80	15.50	20.22	30.00	-9.78

8.11.4. POWER SPECTRAL DENISTY

LIMITS

FCC §15.247

IC RSS-210 A8.2

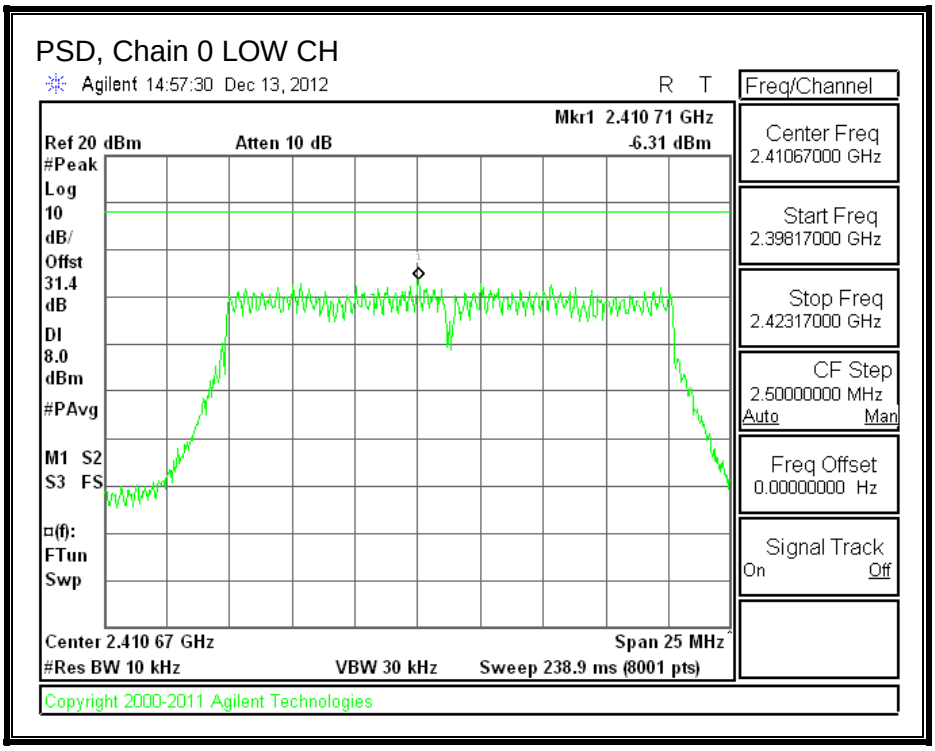
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

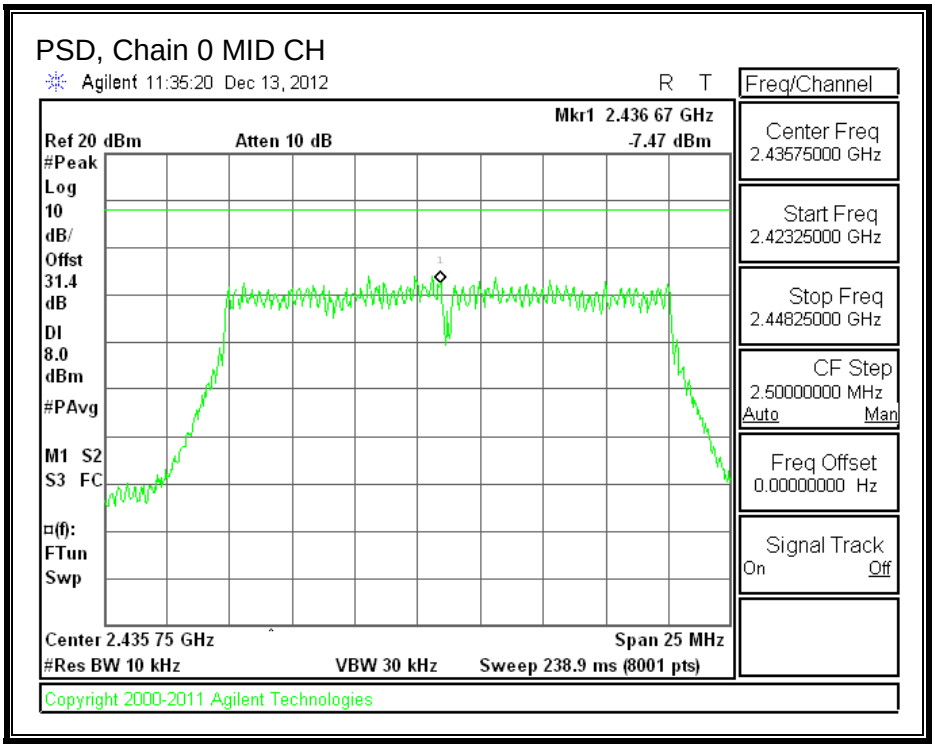
RESULTS

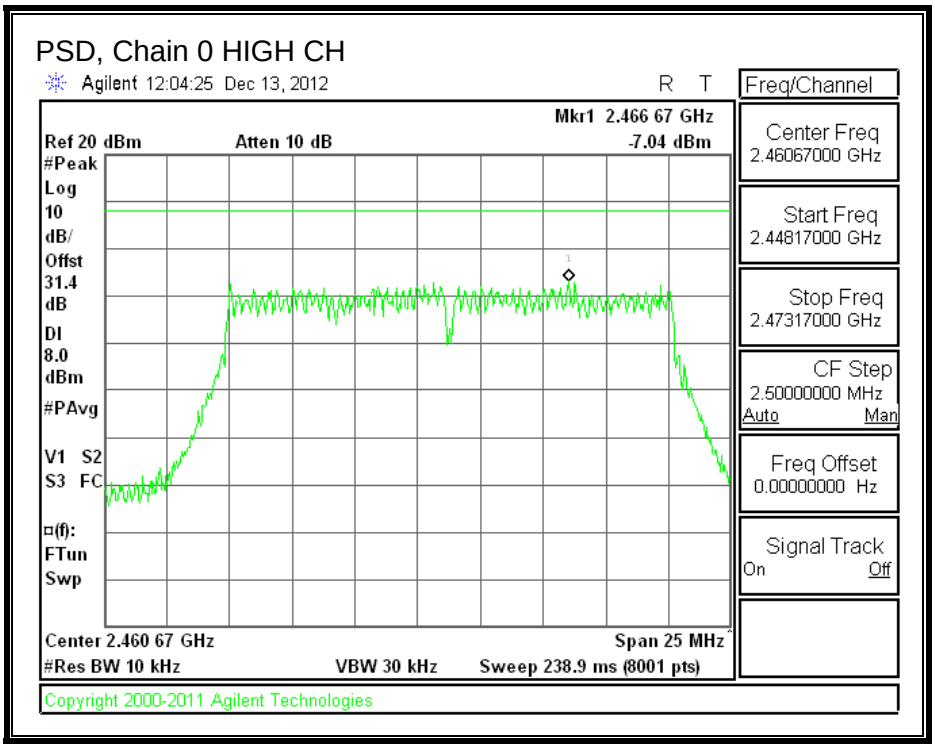
PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Chain 2 Meas (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-6.31	-6.22	-6.61	-1.61	8.0	-9.6
Mid	2437	-7.47	-5.64	-6.75	-1.78	8.0	-9.8
High	2462	-7.04	-4.50	-5.76	-0.87	8.0	-8.9

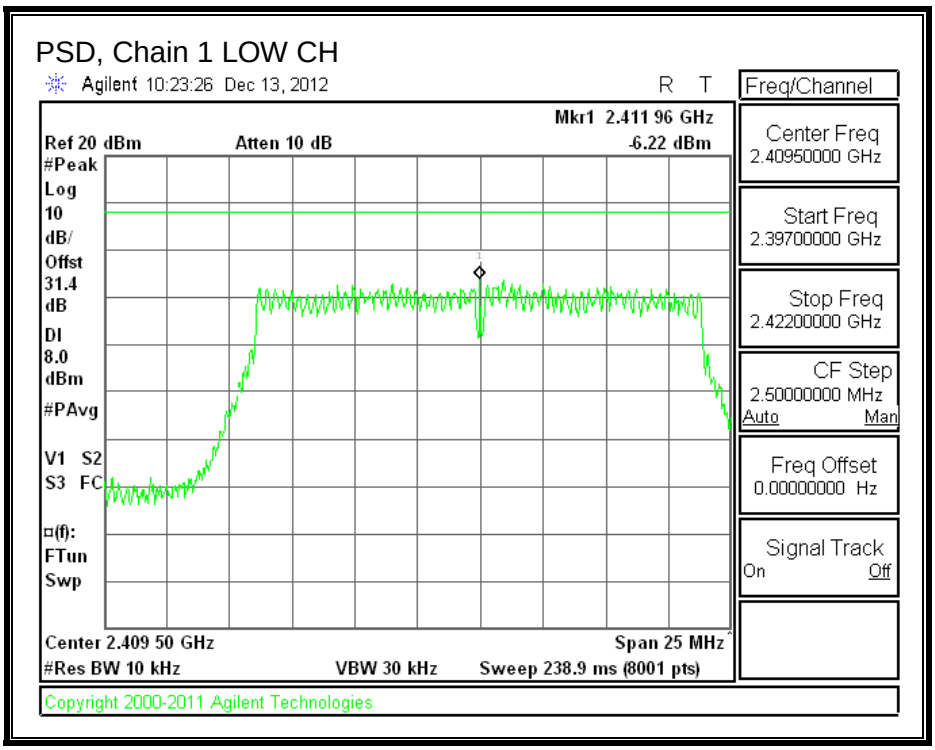
PSD, Chain 0



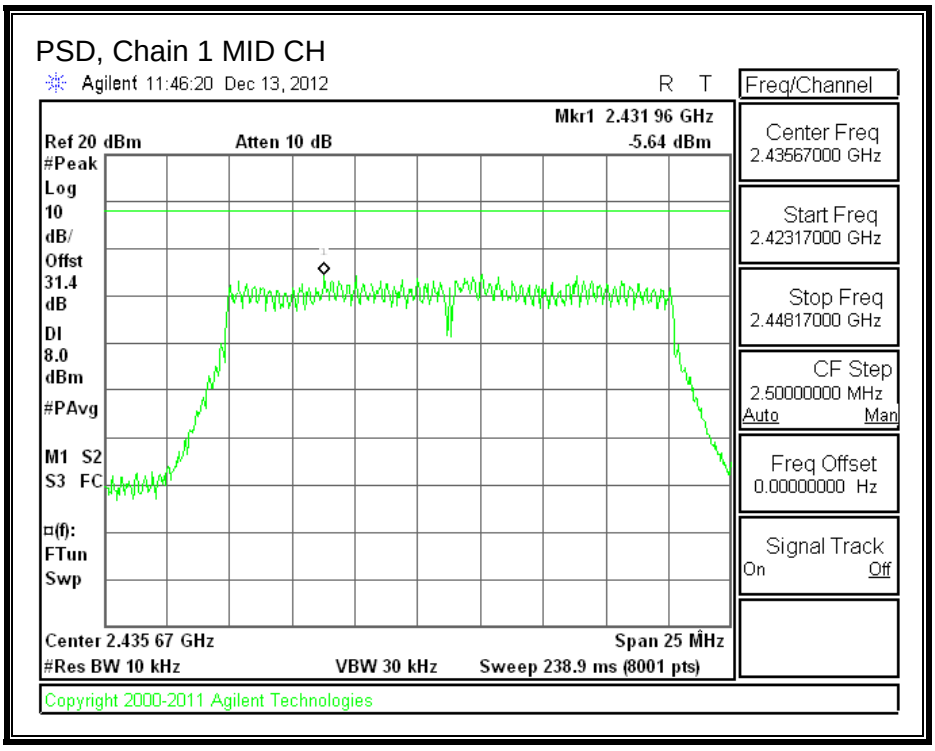




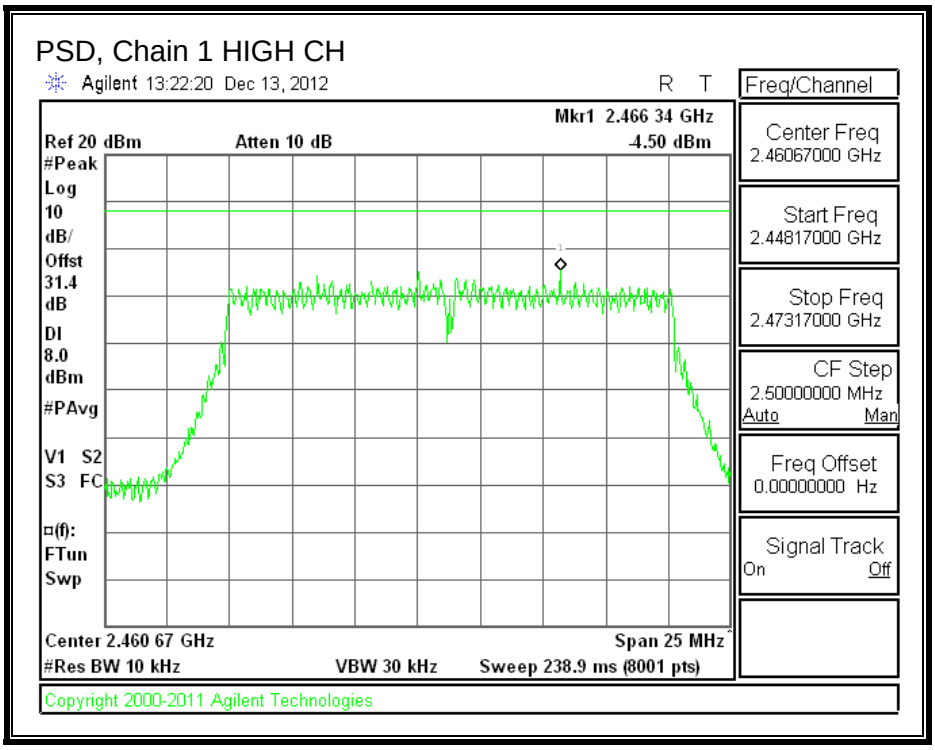
PSD, Chain 1



PSD, Chain 1 MID CH



PSD, Chain 1 HIGH CH



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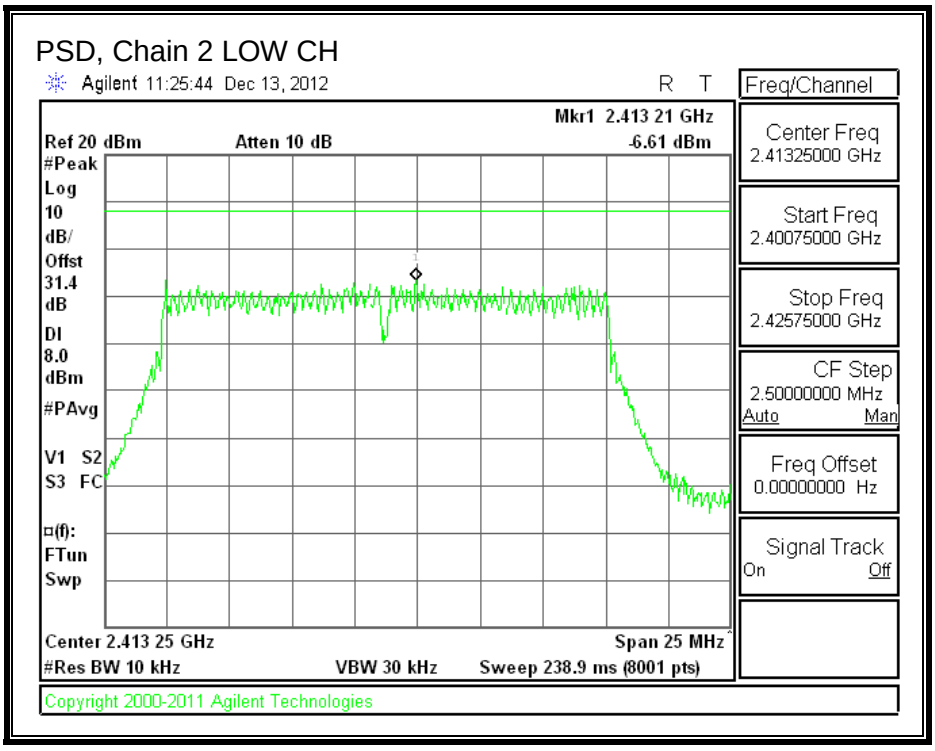
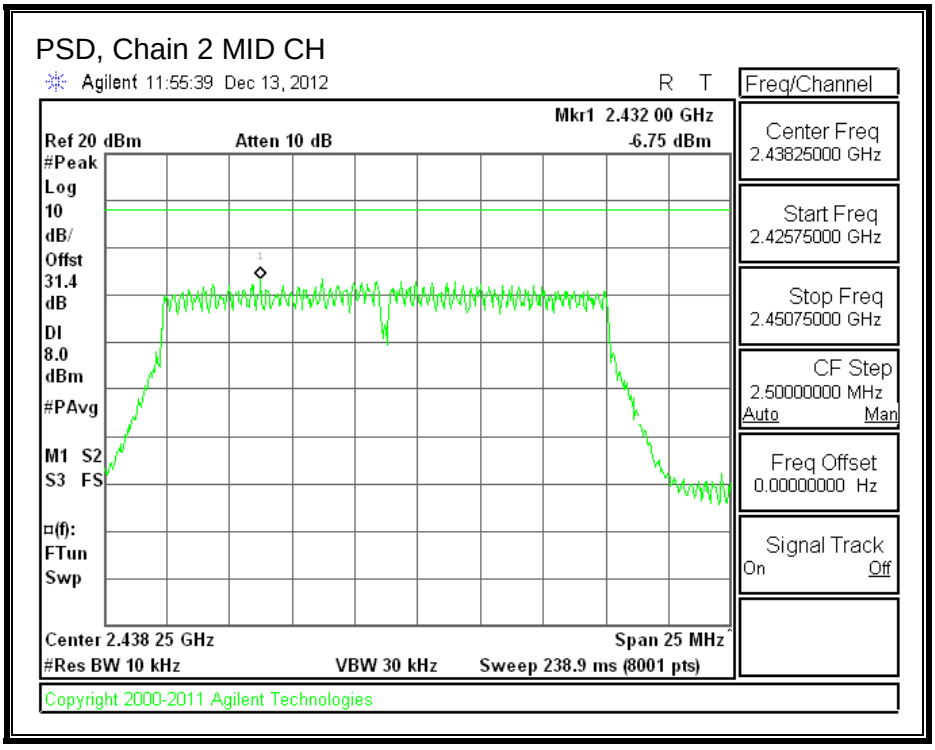
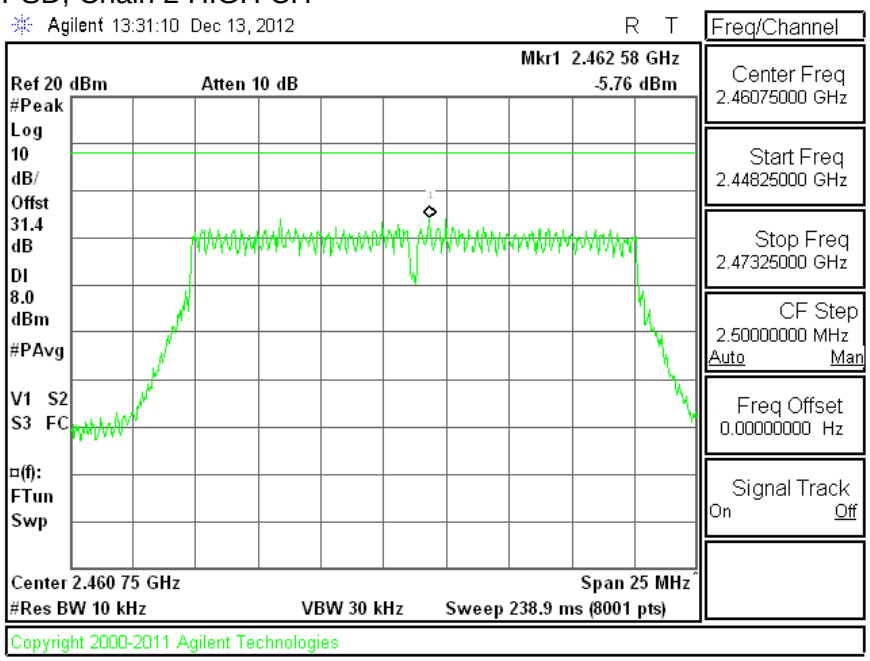




PSD, Chain 2 HIGH CH



8.11.5. OUT-OF-BAND EMISSIONS

LIMITS

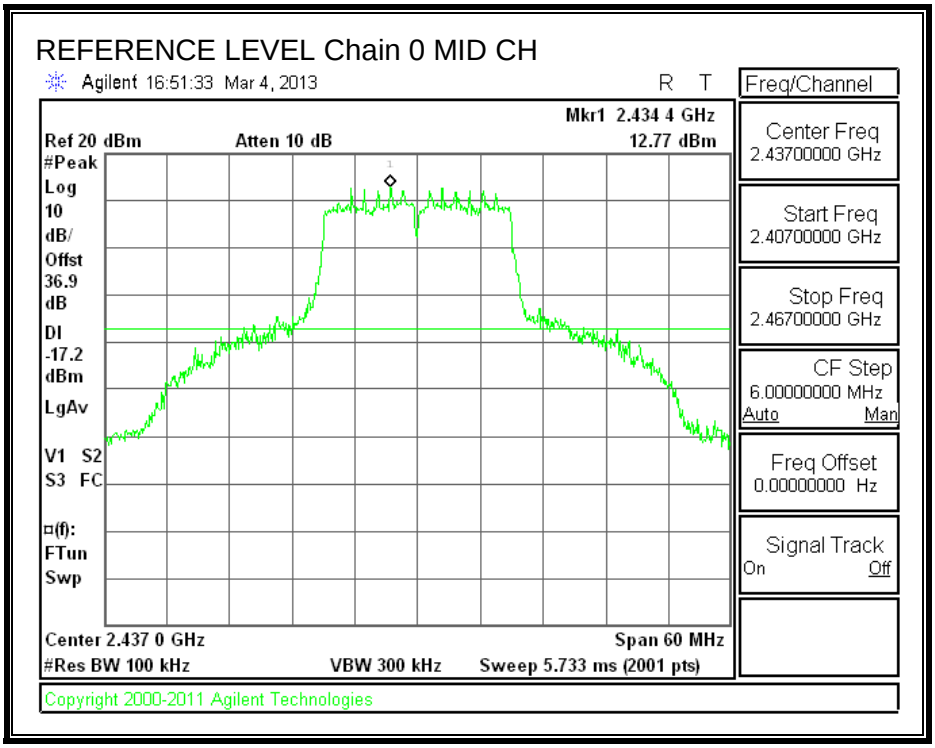
FCC §15.247 (d)

IC RSS-210 A8.5

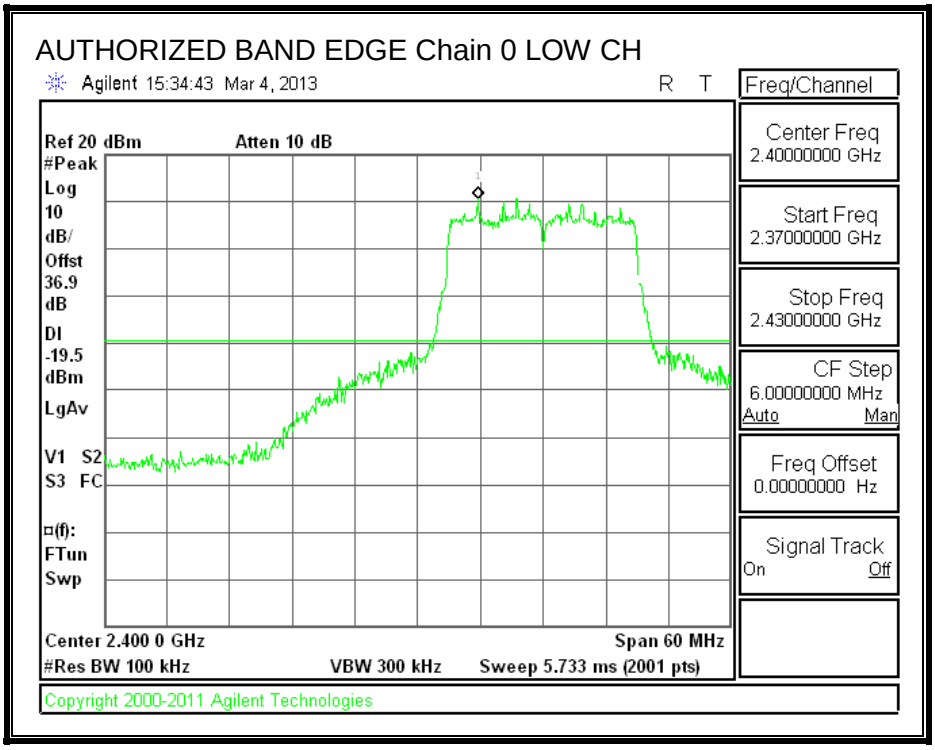
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

RESULTS

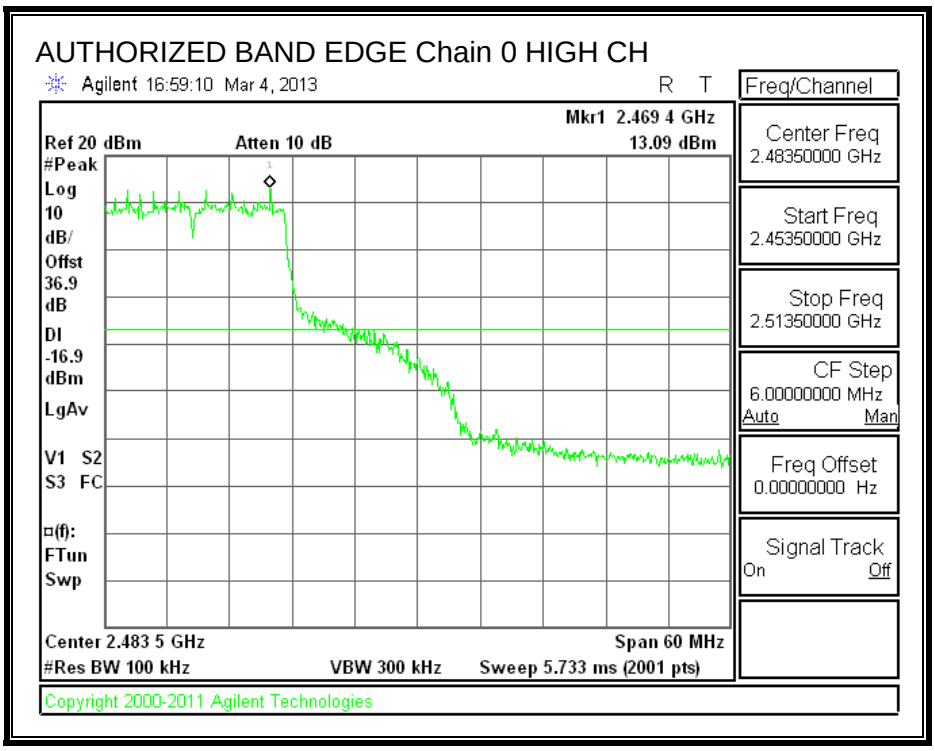
IN-BAND REFERENCE LEVEL, Chain 0



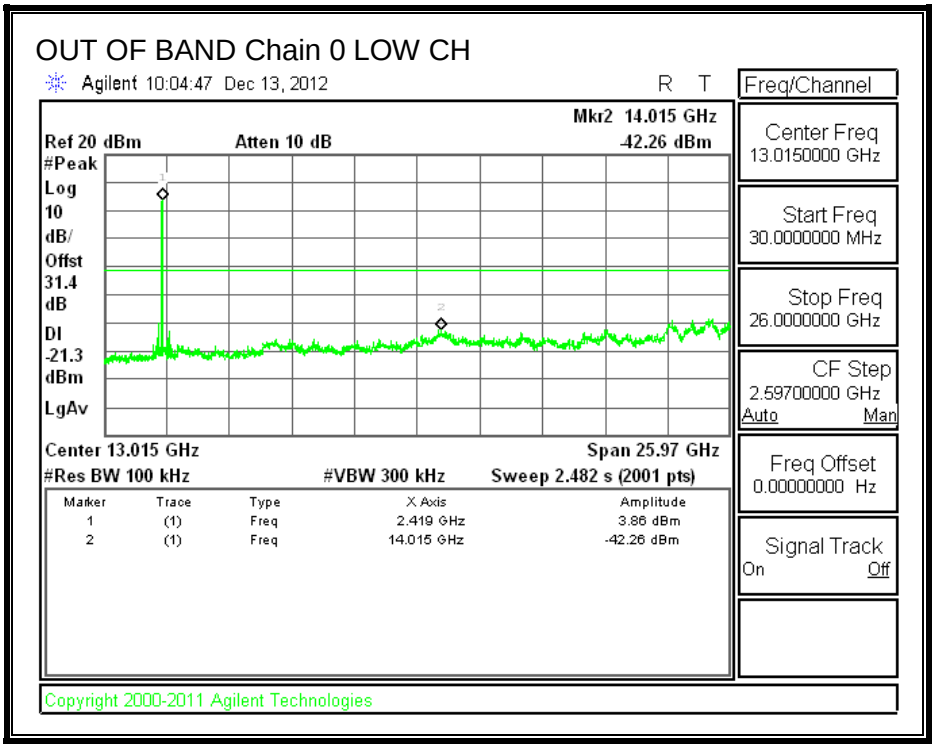
LOW CHANNEL BANDEDGE, Chain 0

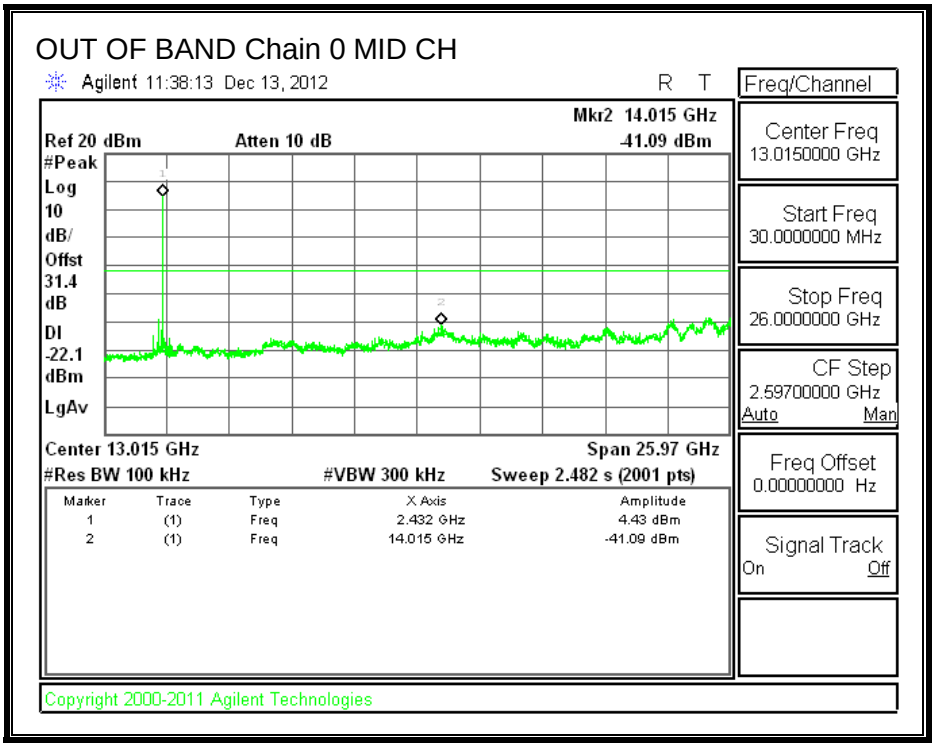


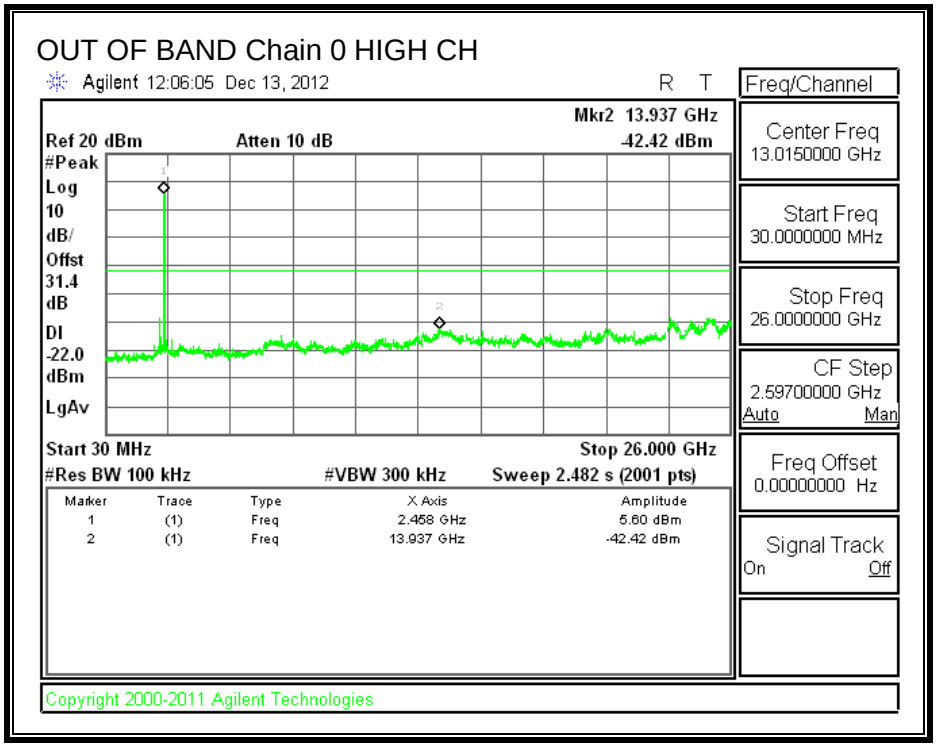
HIGH CHANNEL BANDEDGE, Chain 0



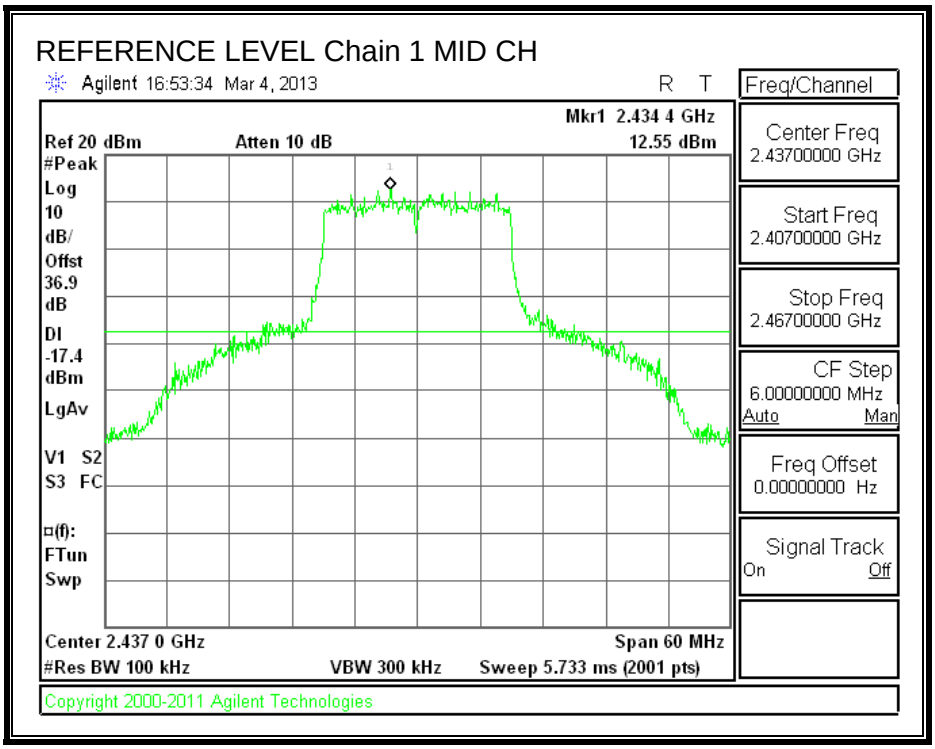
OUT-OF-BAND EMISSIONS, Chain 0



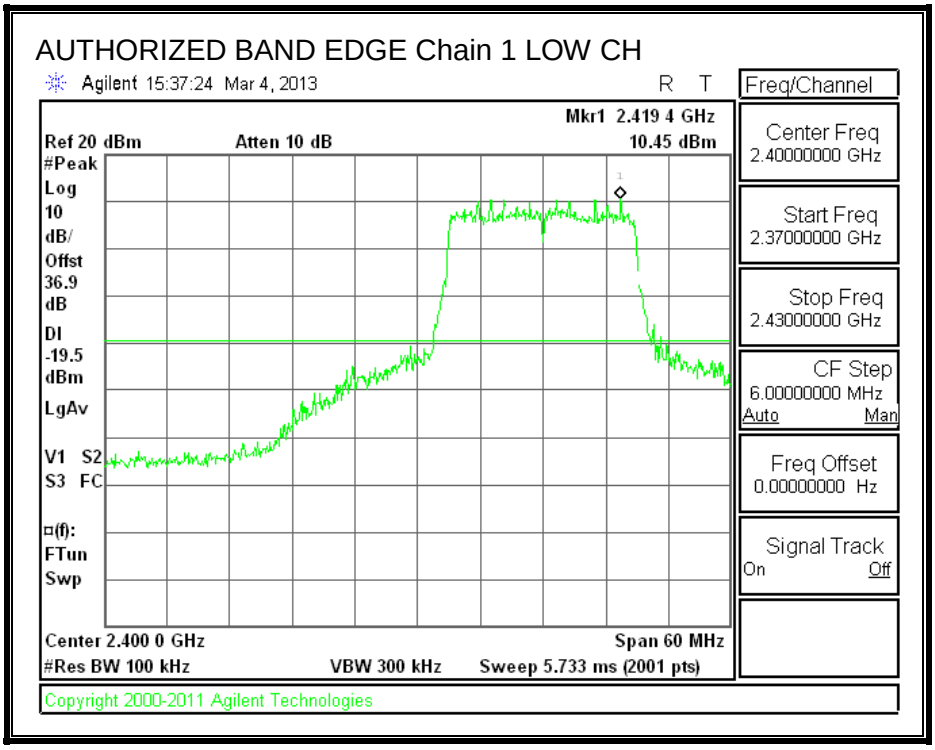




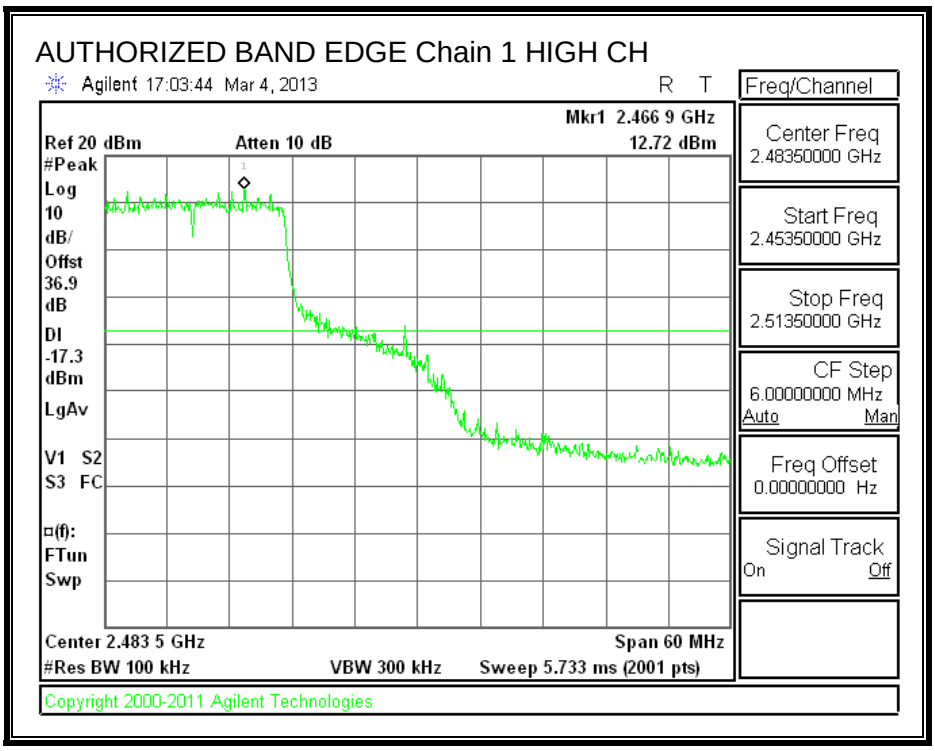
IN-BAND REFERENCE LEVEL, Chain 1



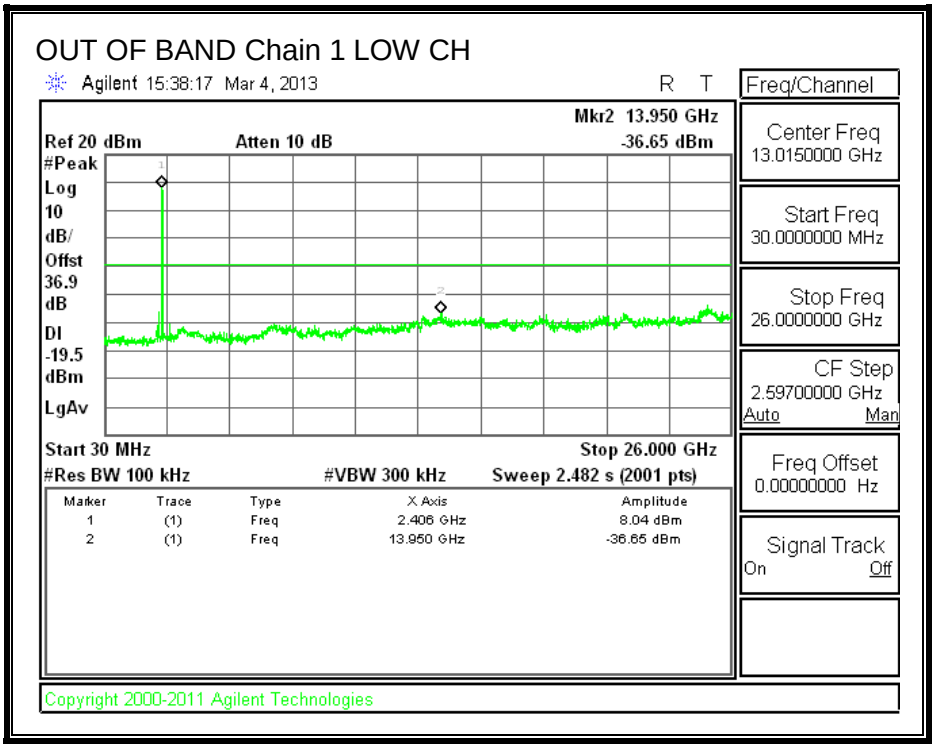
LOW CHANNEL BANDEDGE, Chain 1

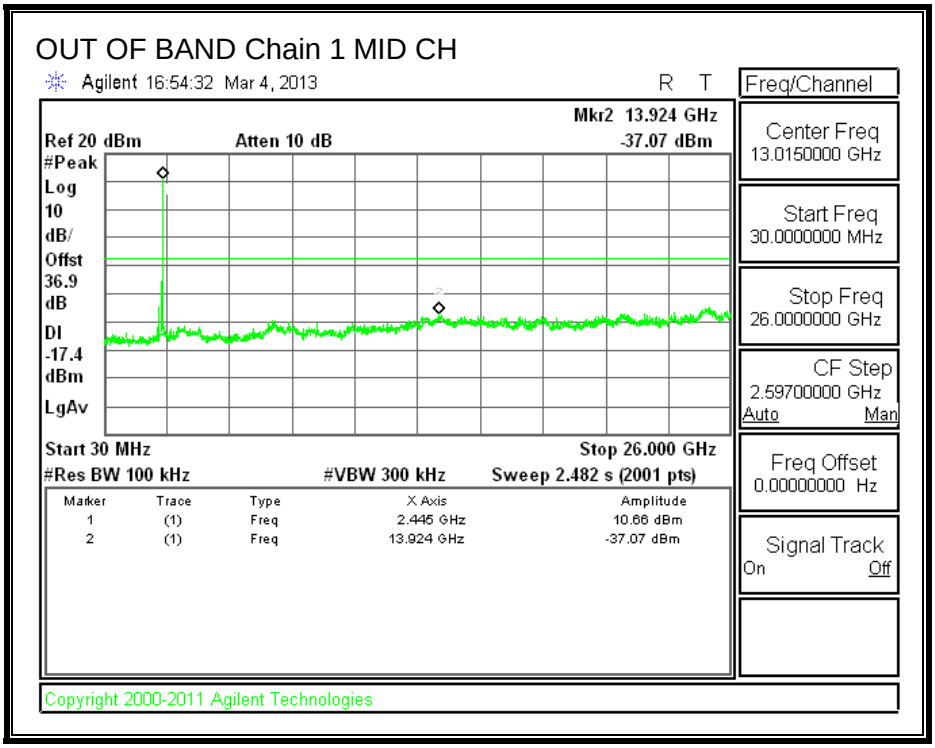


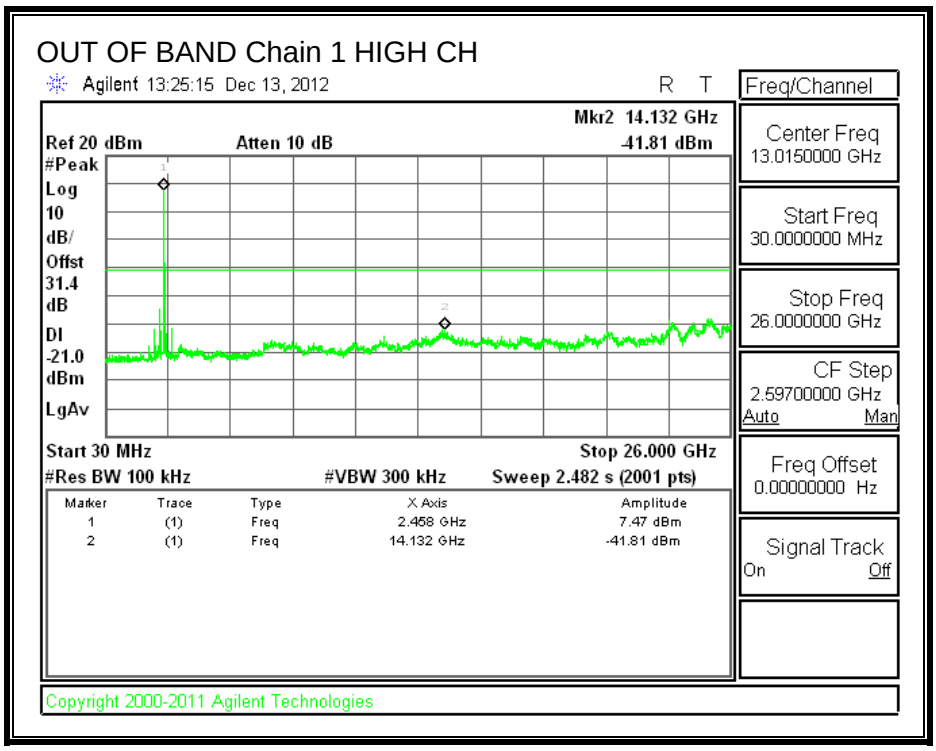
HIGH CHANNEL BANDEDGE, Chain 1



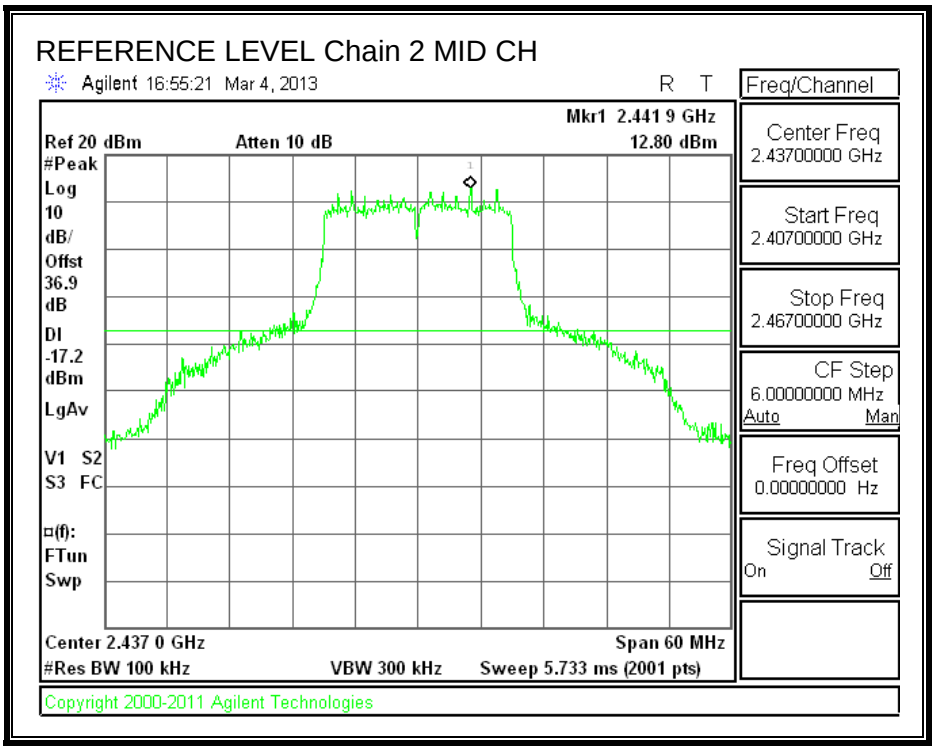
OUT-OF-BAND EMISSIONS, Chain 1



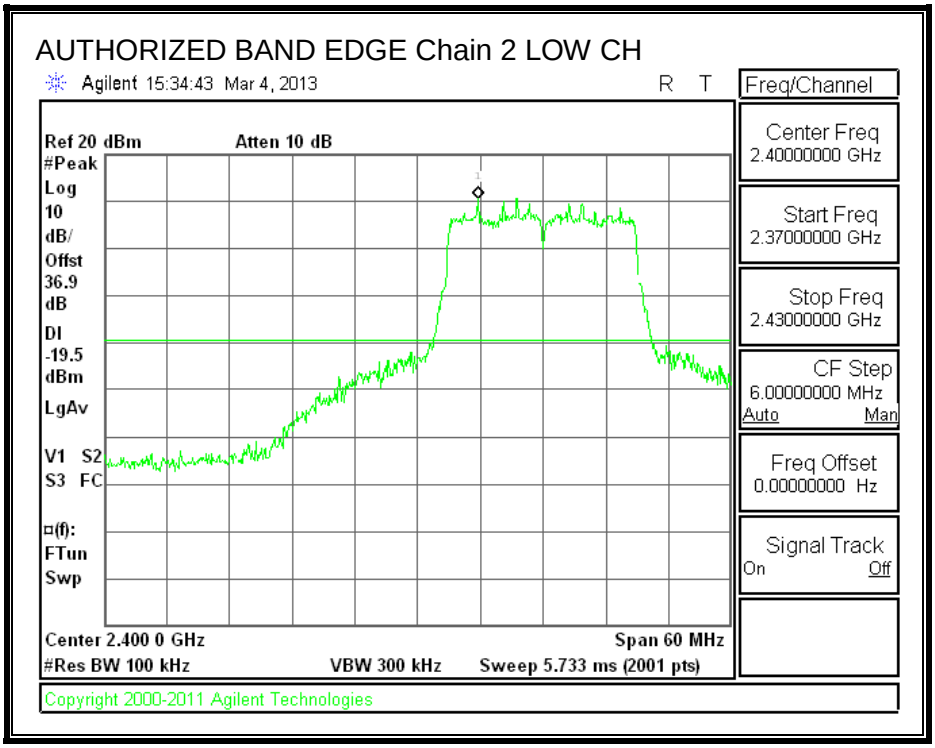




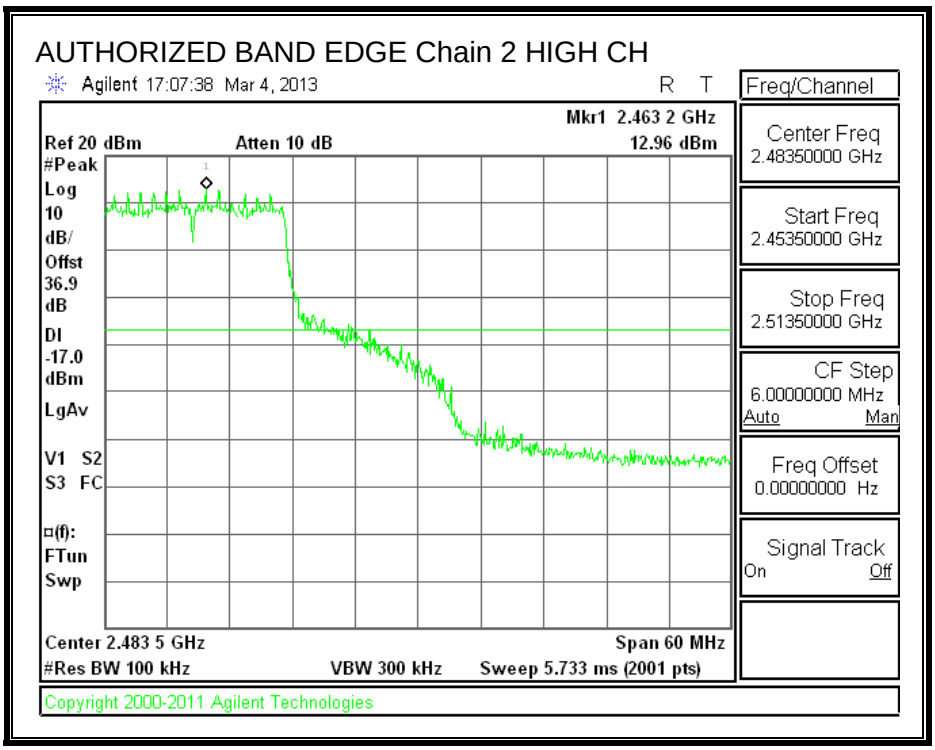
IN-BAND REFERENCE LEVEL, Chain 2



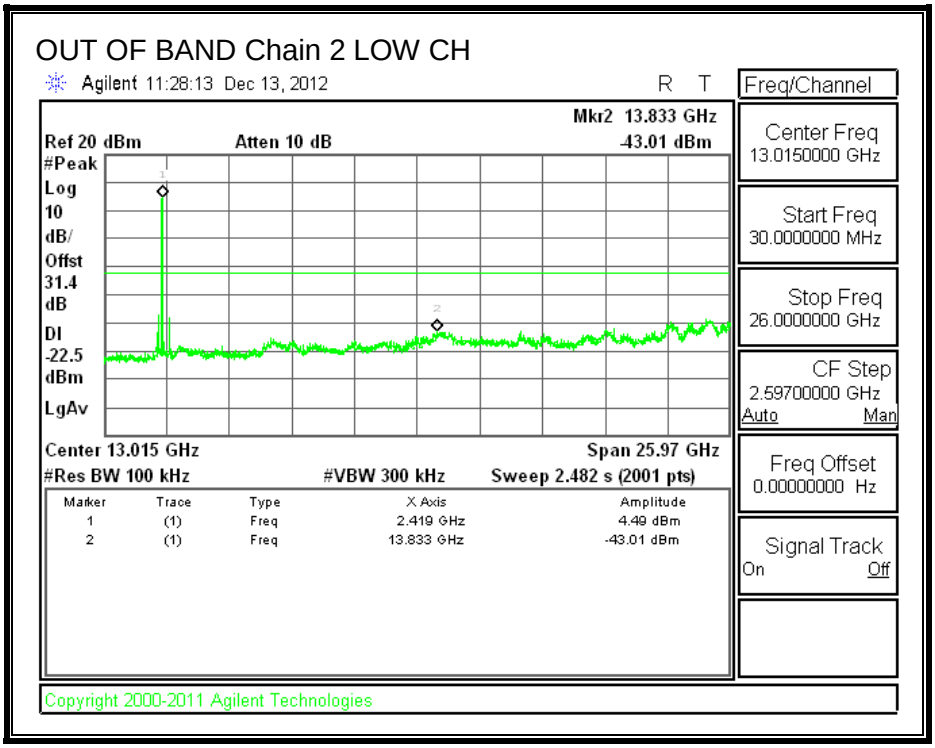
LOW CHANNEL BANDEDGE, Chain 2

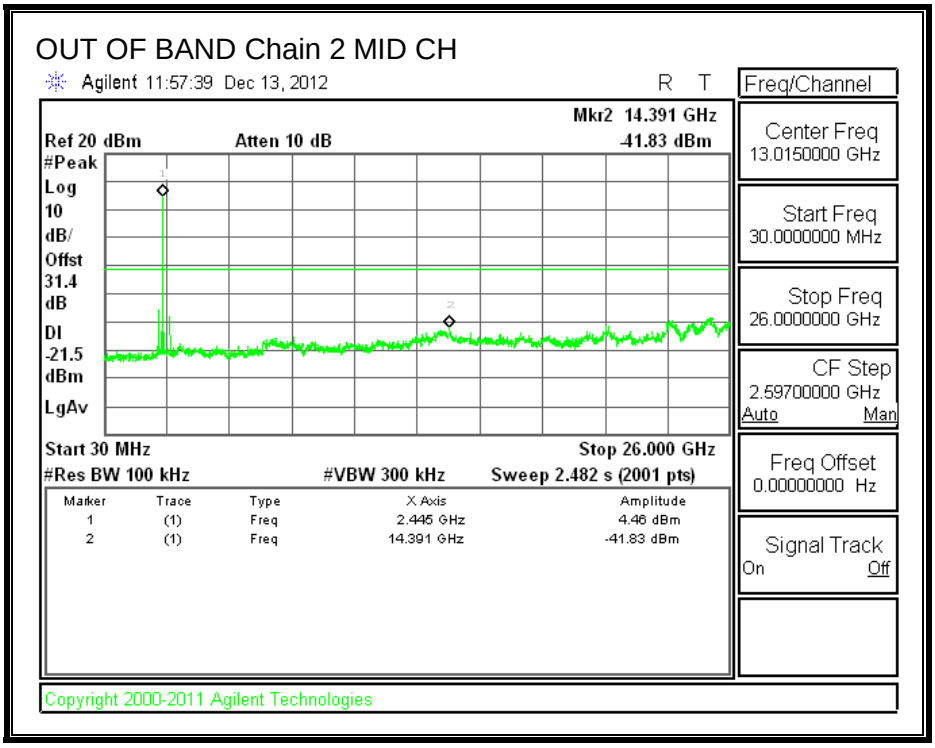


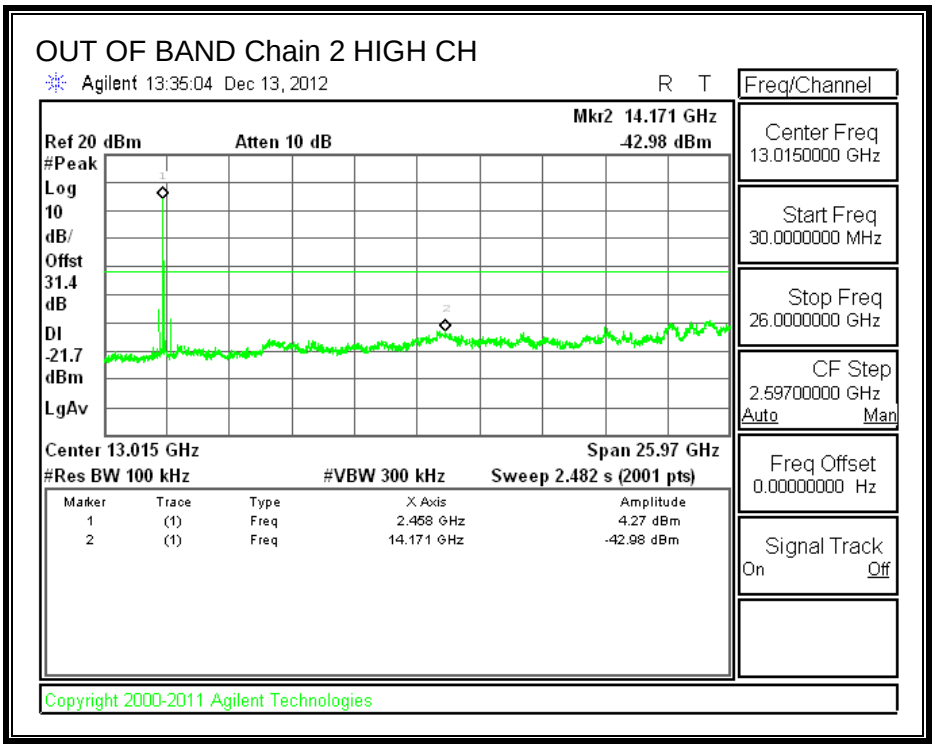
HIGH CHANNEL BANDEDGE, Chain 2



OUT-OF-BAND EMISSIONS, Chain 2







8.12. 802.11a 1TX MODE IN THE 5.8 GHz BAND

Covered by testing 11n HT20 CDD 3TX, power per chain used in the 802.11n HT20 CDD 3TX mode is equal to the power per chain that will be used for 802.11a 1TX.

8.13. 802.11a CDD 2TX MODE IN THE 5.8 GHz BAND

Covered by testing 11n HT20 CDD 3TX, power per chain used in the 802.11n HT20 CDD 3TX mode is equal to the power per chain that will be used for 802.11a 2TX.

8.14. 802.11a CDD 3TX MODE IN THE 5.8 GHz BAND

Covered by testing 11n HT20 CDD 3TX, power per chain used in the 802.11n HT20 CDD 3TX mode is equal to the power per chain that will be used for 802.11a 3TX.

8.15. 802.11n HT20 1TX MODE IN THE 5.8 GHz BAND

Covered by testing 11n HT20 CDD 3TX, power per chain used in the 802.11n HT20 CDD 3TX mode is equal to the power per chain that will be used for 802.11n HT20 1TX.

8.16. 802.11n HT20 CDD 2TX MODE IN THE 5.8 GHz BAND

Covered by testing 11n HT20 CDD 3TX, power per chain used in the 802.11n HT20 CDD 3TX mode is equal to the power per chain that will be used for 802.11n HT20 2TX.

8.17. 802.11n HT20 CDD 3TX MODE IN THE 5.8 GHz BAND

8.17.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

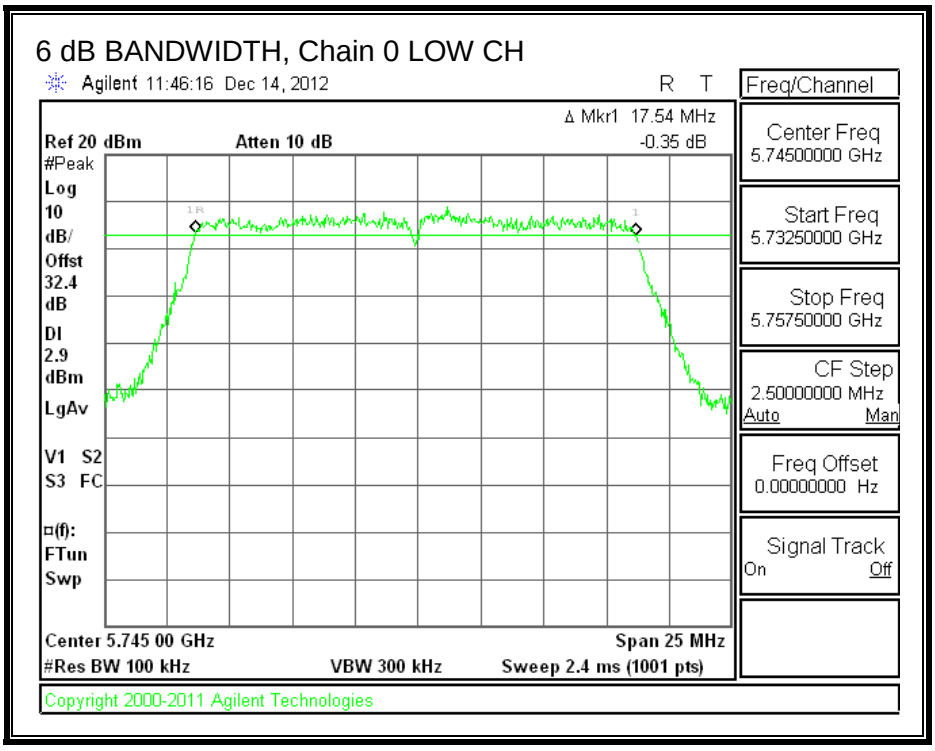
IC RSS-210 A8.2 (a)

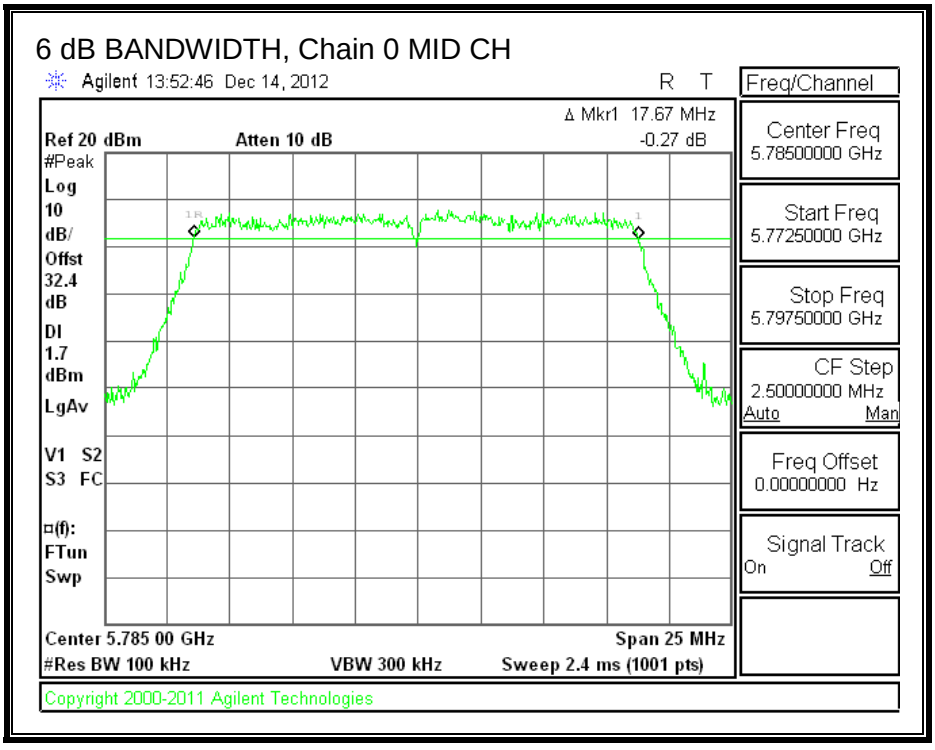
The minimum 6 dB bandwidth shall be at least 500 kHz.

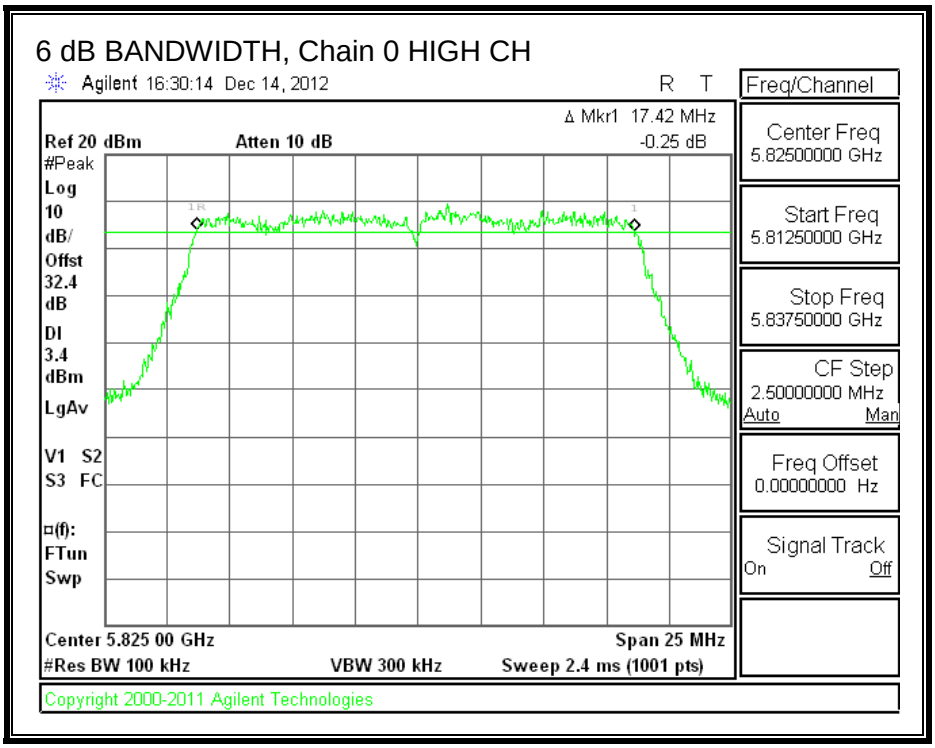
RESULTS

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	6 dB BW Chain 2 (MHz)	Minimum Limit (MHz)
Low	5745	17.54	17.67	17.67	0.5
Mid	5785	17.67	17.67	17.71	0.5
High	5825	17.42	17.71	17.62	0.5

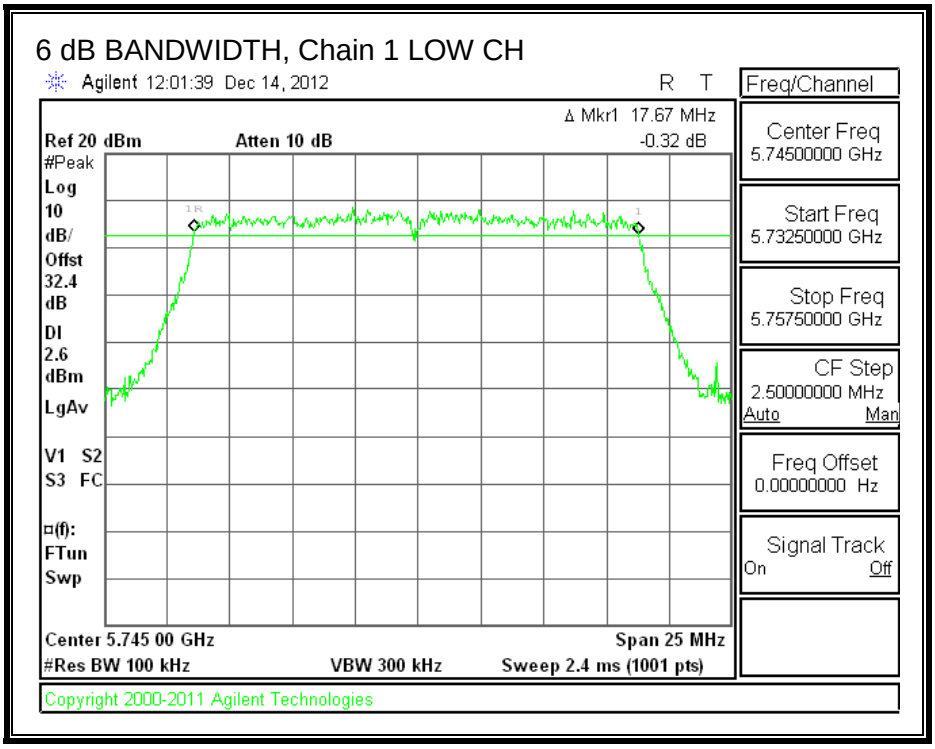
6 dB BANDWIDTH, Chain 0



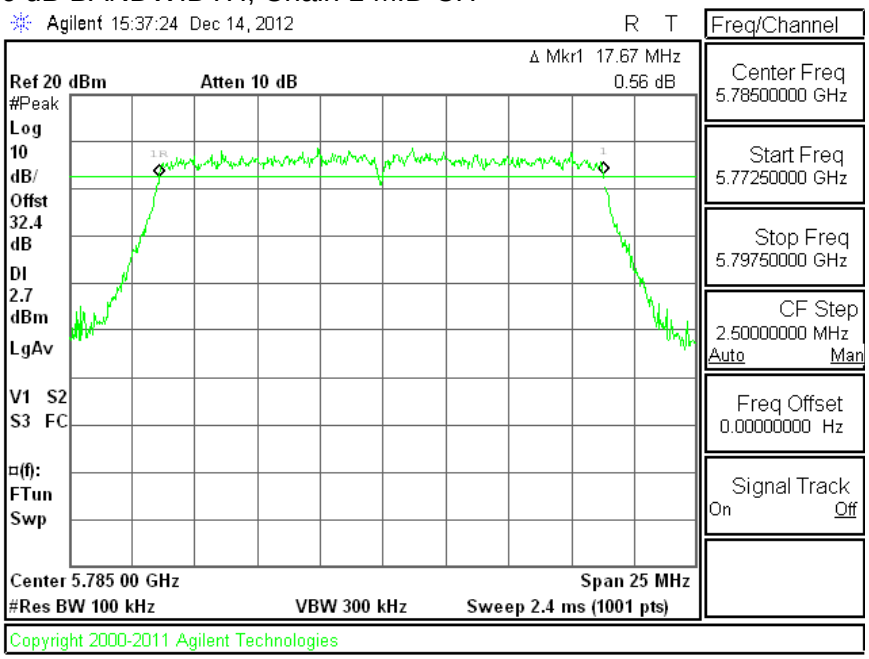




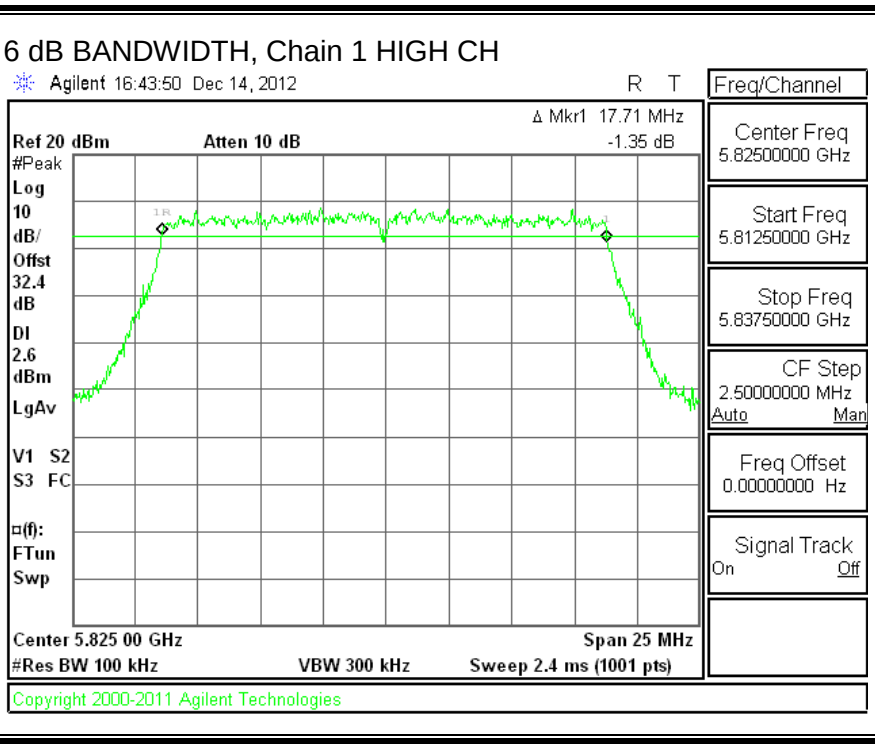
6 dB BANDWIDTH, Chain 1



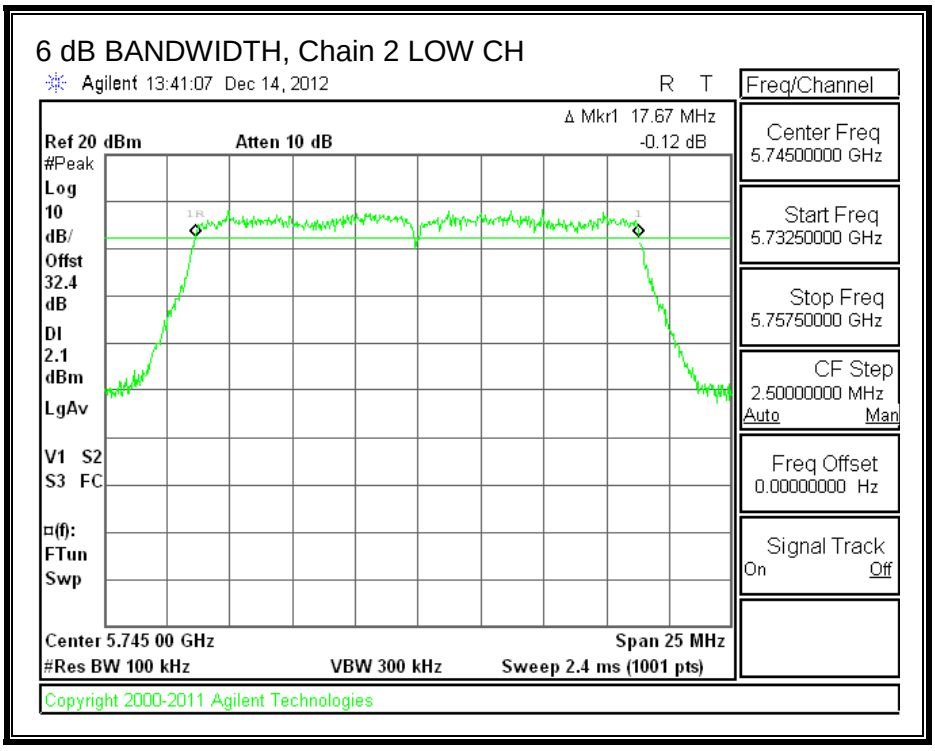
6 dB BANDWIDTH, Chain 1 MID CH

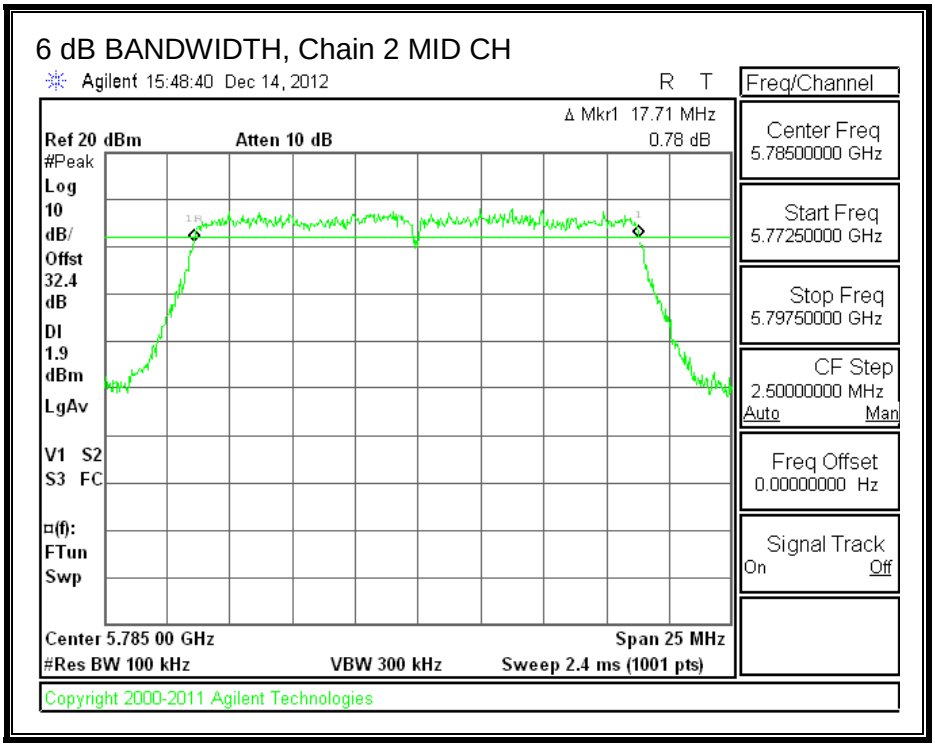


6 dB BANDWIDTH, Chain 1 HIGH CH

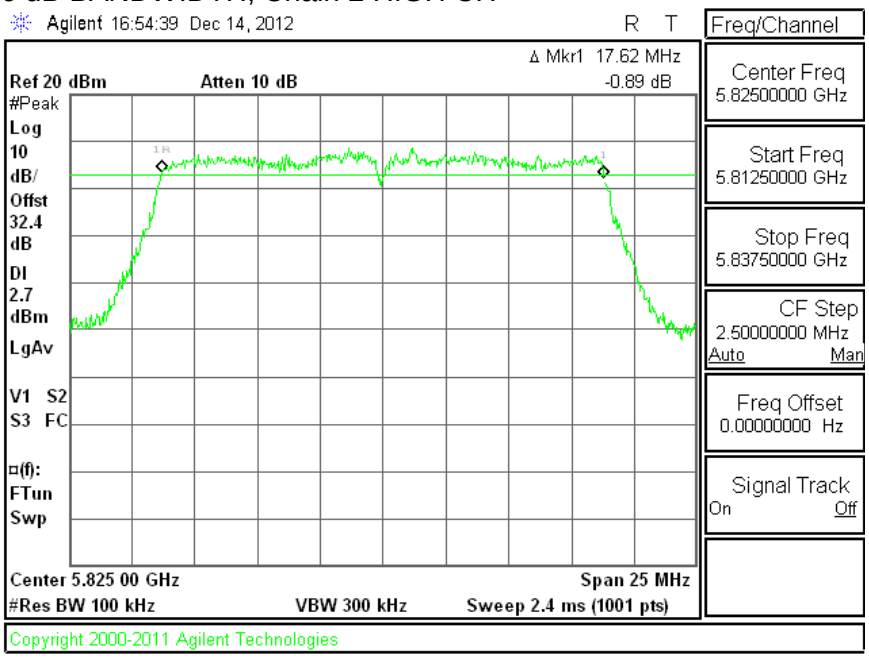


6 dB BANDWIDTH, Chain 2





6 dB BANDWIDTH, Chain 2 HIGH CH



8.17.2. 99% BANDWIDTH

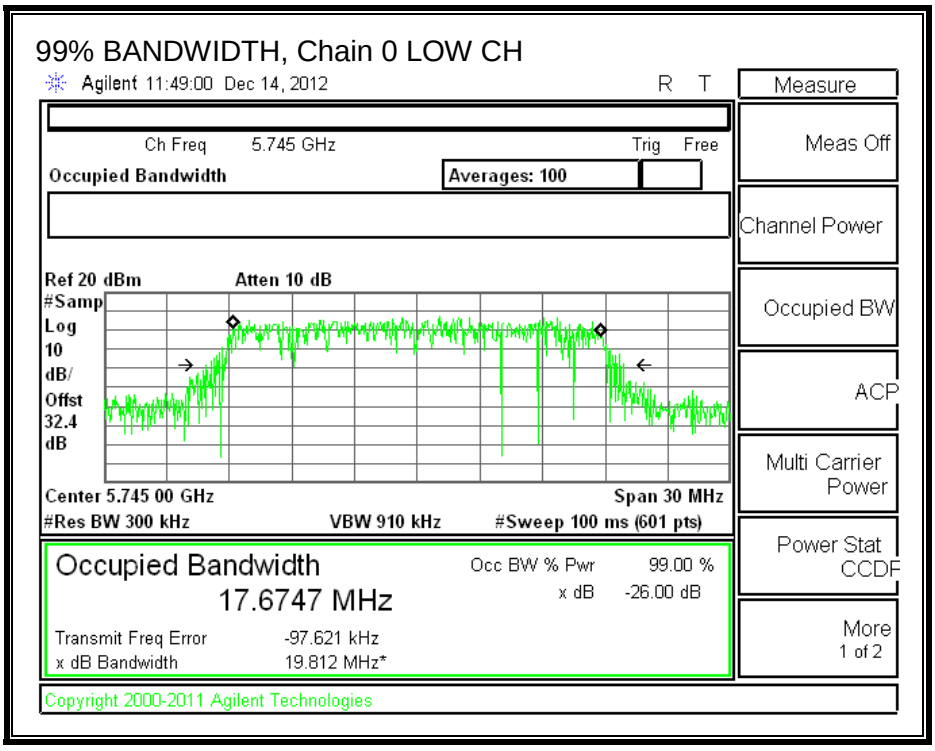
LIMITS

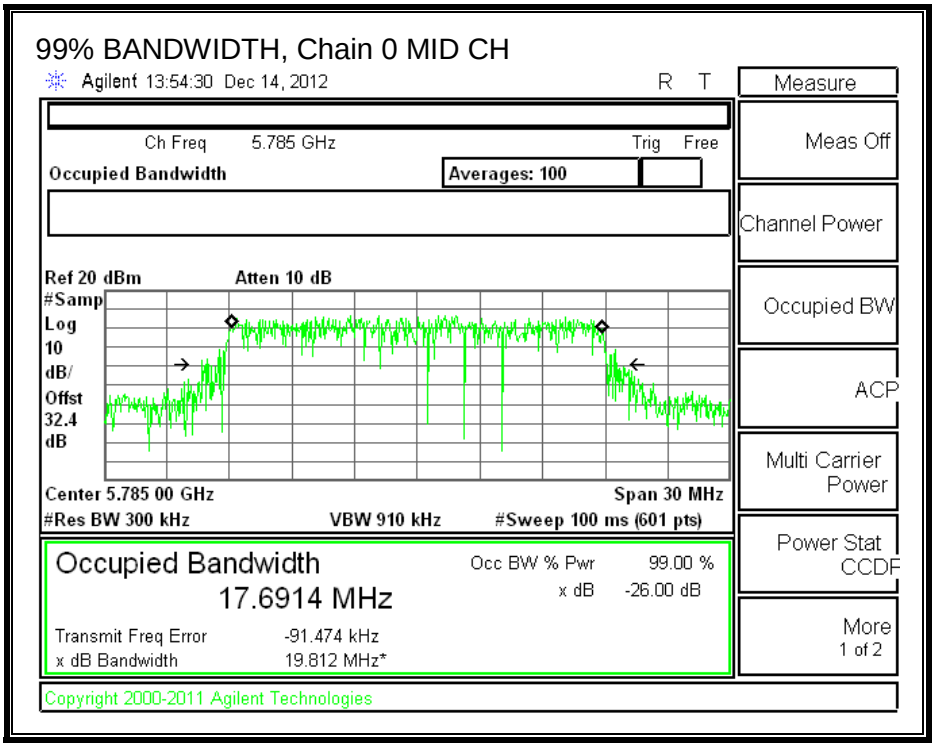
None; for reporting purposes only.

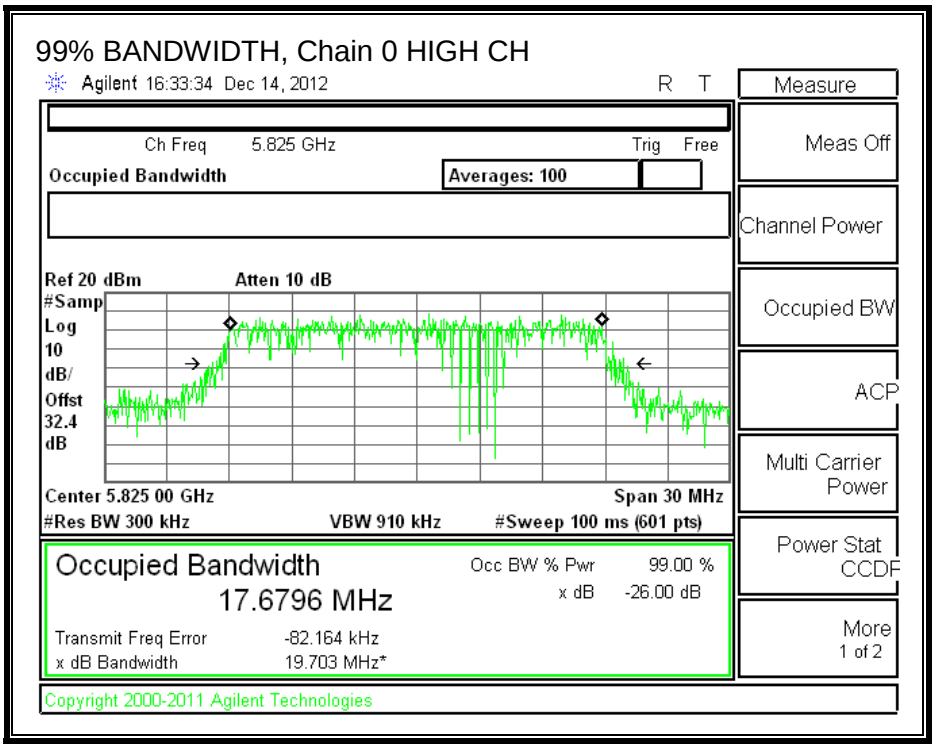
RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Low	5745	17.6747	17.6986	17.6900
Mid	5785	17.6914	17.6957	17.6913
High	5825	17.6796	17.6433	17.6859

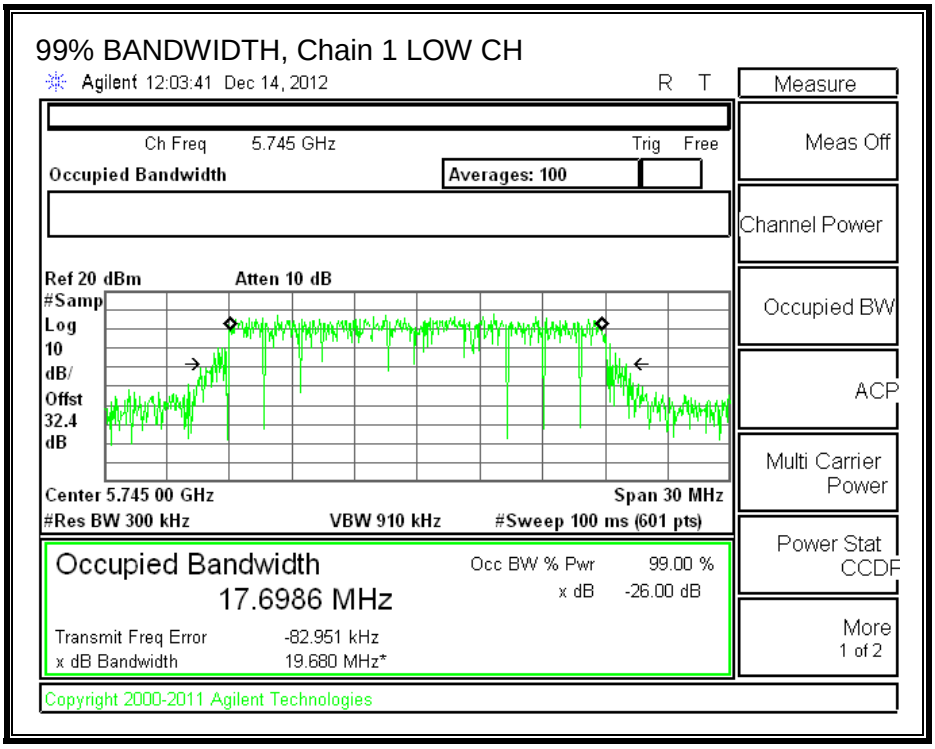
99% BANDWIDTH, Chain 0

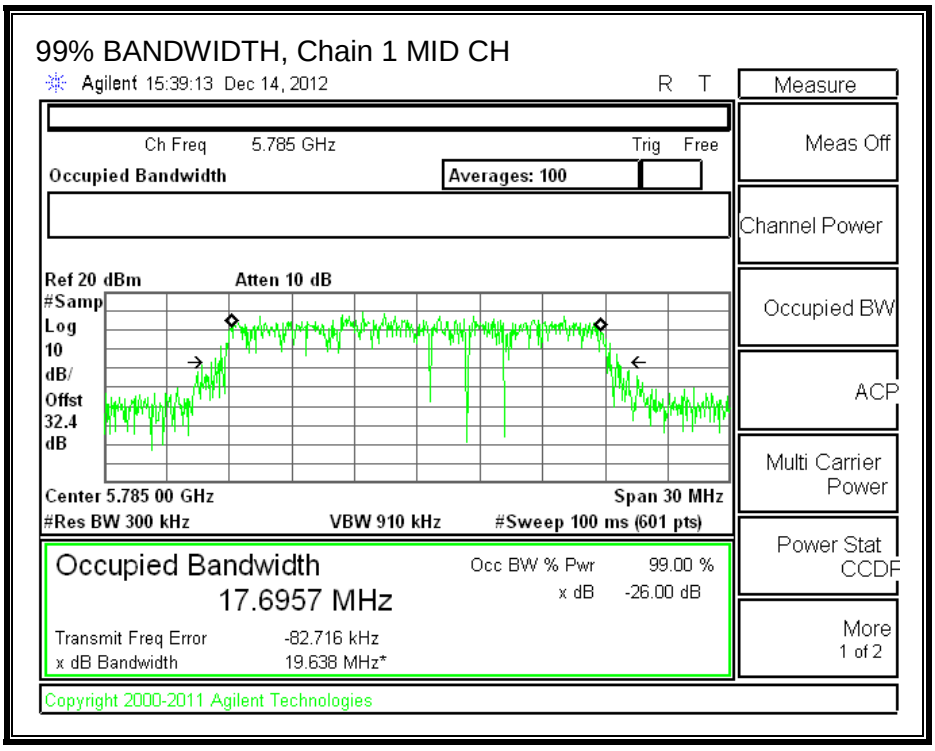


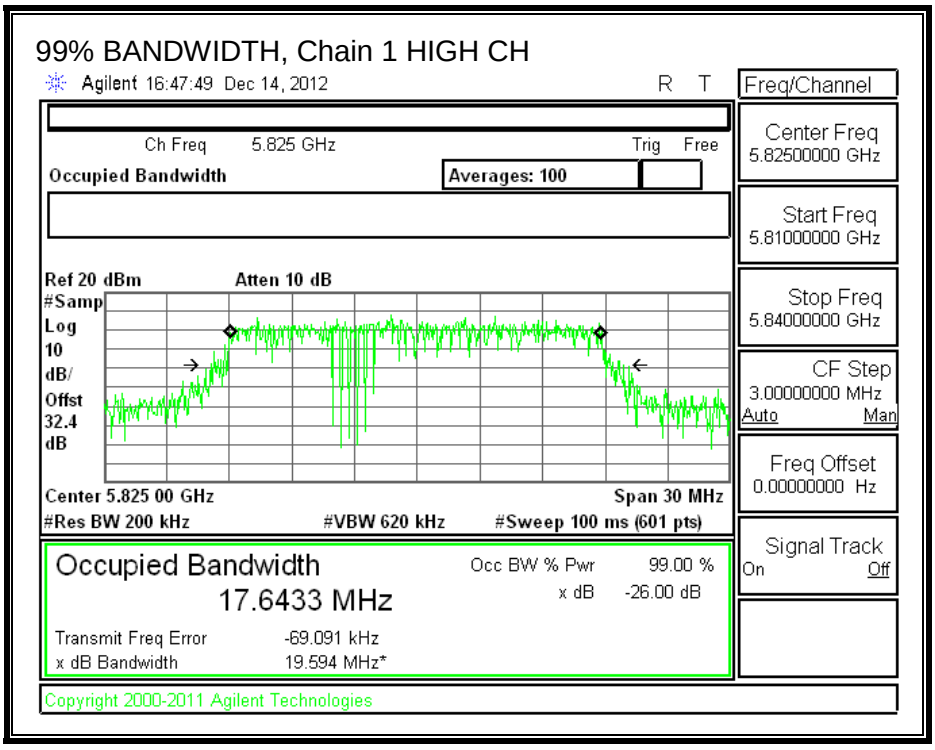




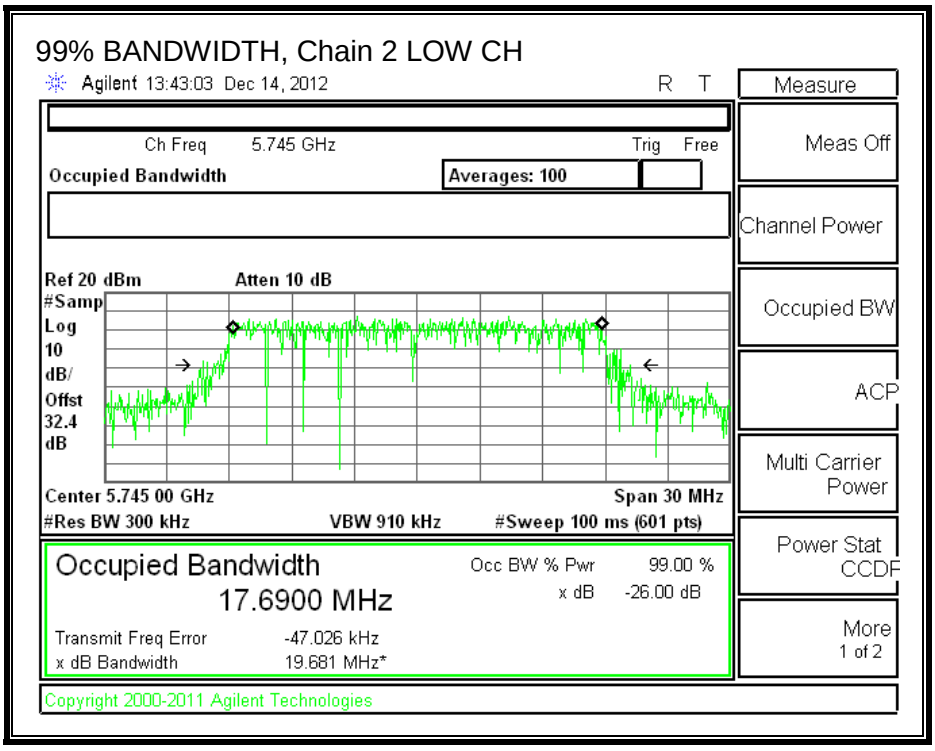
99% BANDWIDTH, Chain 1

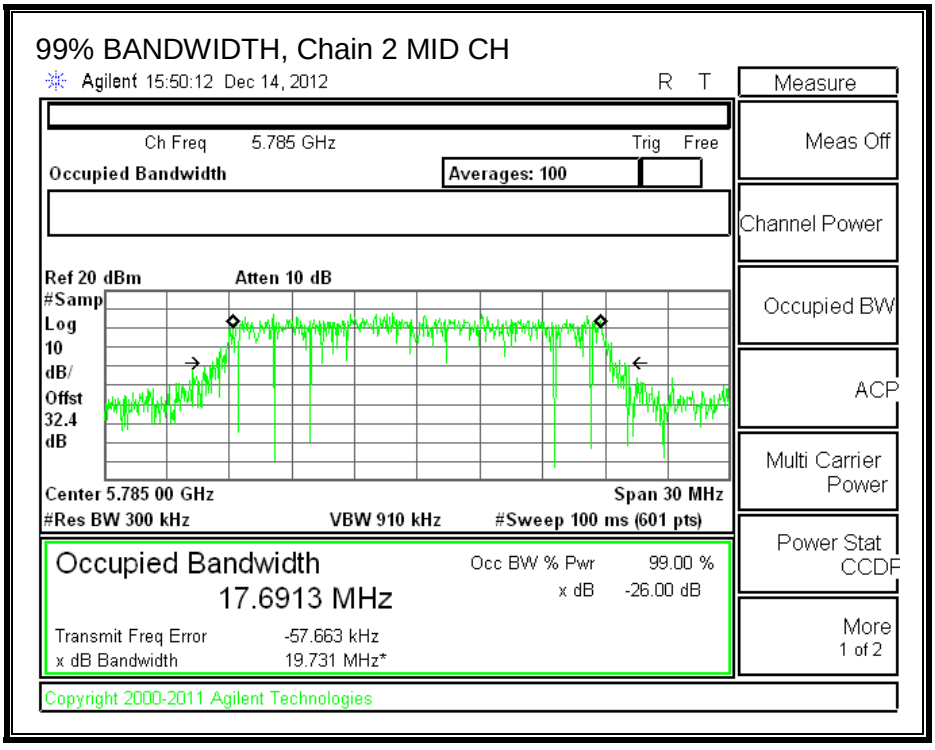


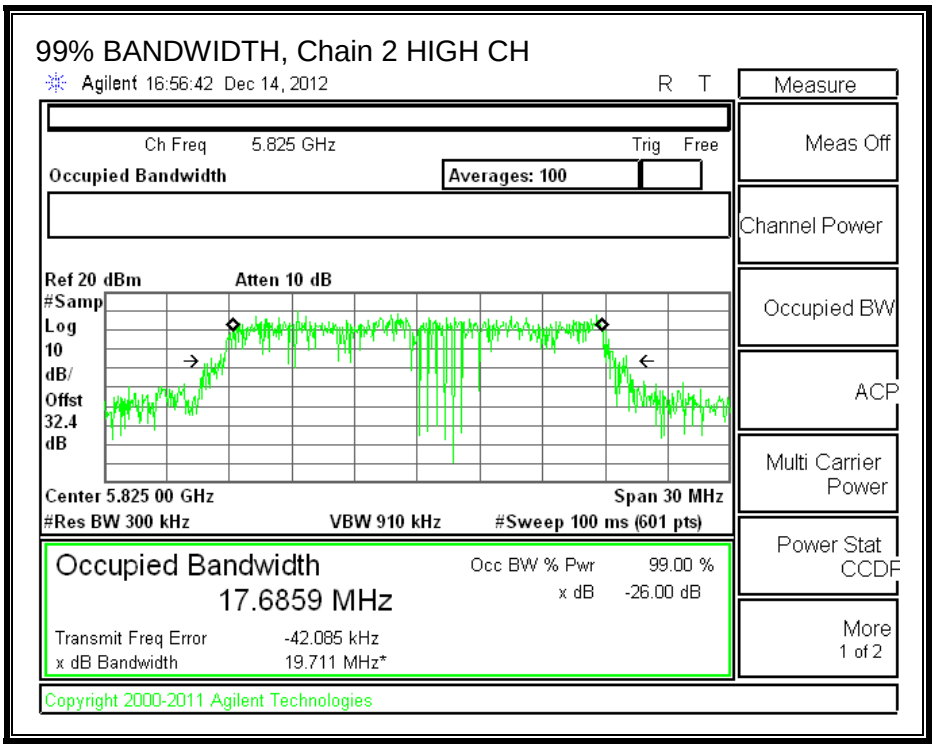




99% BANDWIDTH, Chain 2







8.17.3. OUTPUT AVERAGE POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
2.70	1.90	4.40	3.13

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	5745	3.13	30.00	30	36	30.00
Mid	5785	3.13	30.00	30	36	30.00
High	5825	3.13	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	5745	22.10	22.30	22.00	26.91	30.00	-3.09
Mid	5785	24.80	25.20	24.90	29.74	30.00	-0.26
High	5825	23.80	24.10	23.90	28.71	30.00	-1.29

8.17.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247

IC RSS-210 A8.2

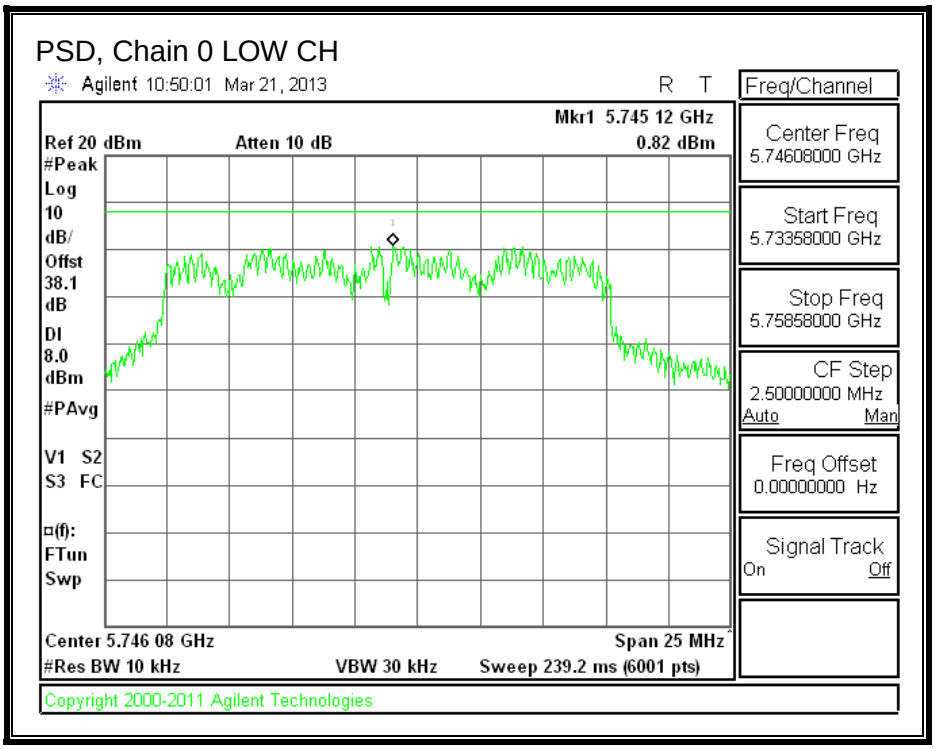
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

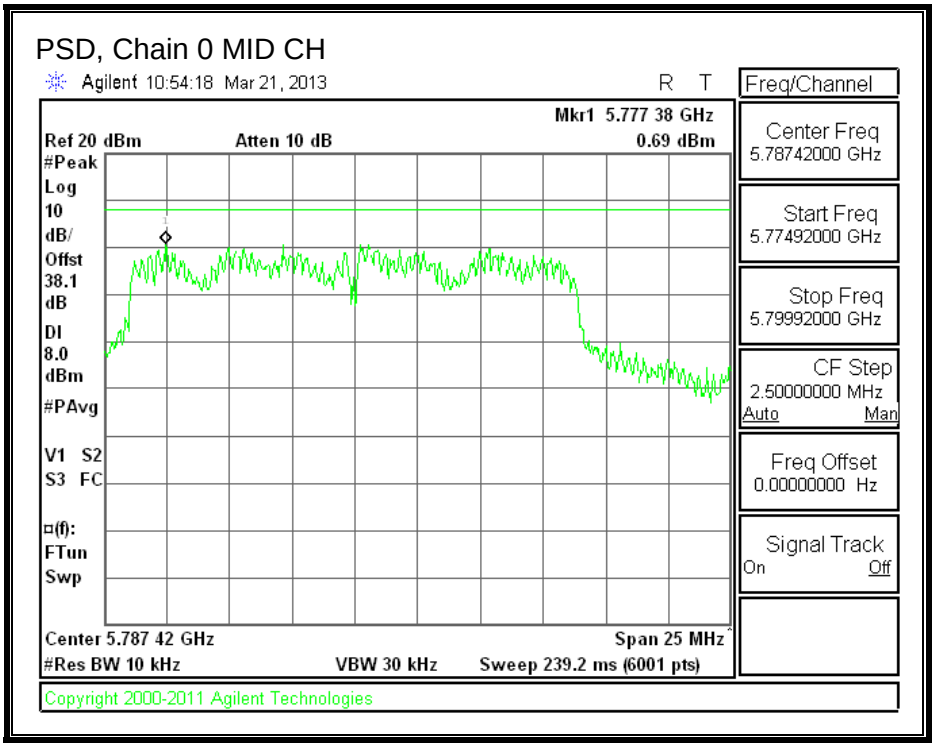
RESULTS

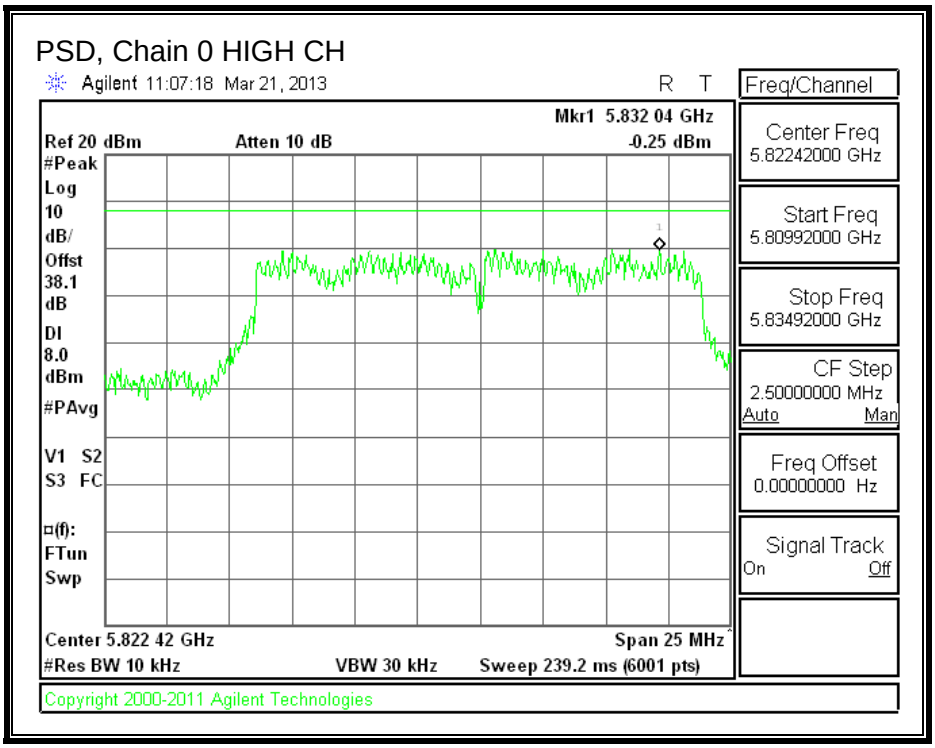
PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Chain 2 Meas (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	5745	0.82	1.24	1.42	5.94	8.0	-2.1
Mid	5785	0.69	1.89	3.01	6.74	8.0	-1.3
High	5825	-0.25	0.90	0.18	5.07	8.0	-2.9

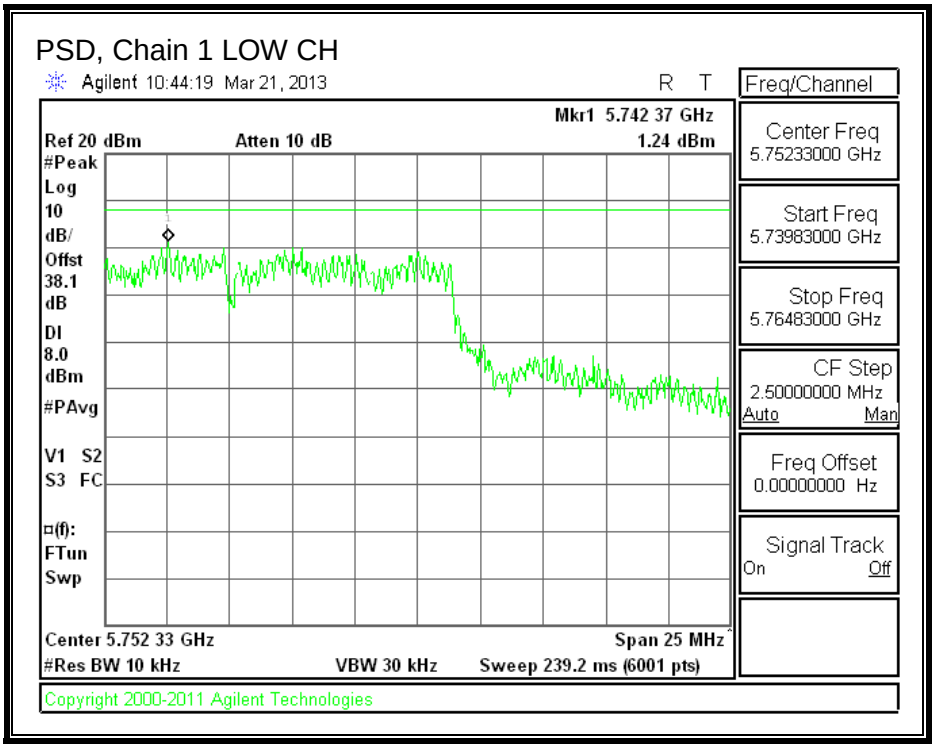
PSD, Chain 0



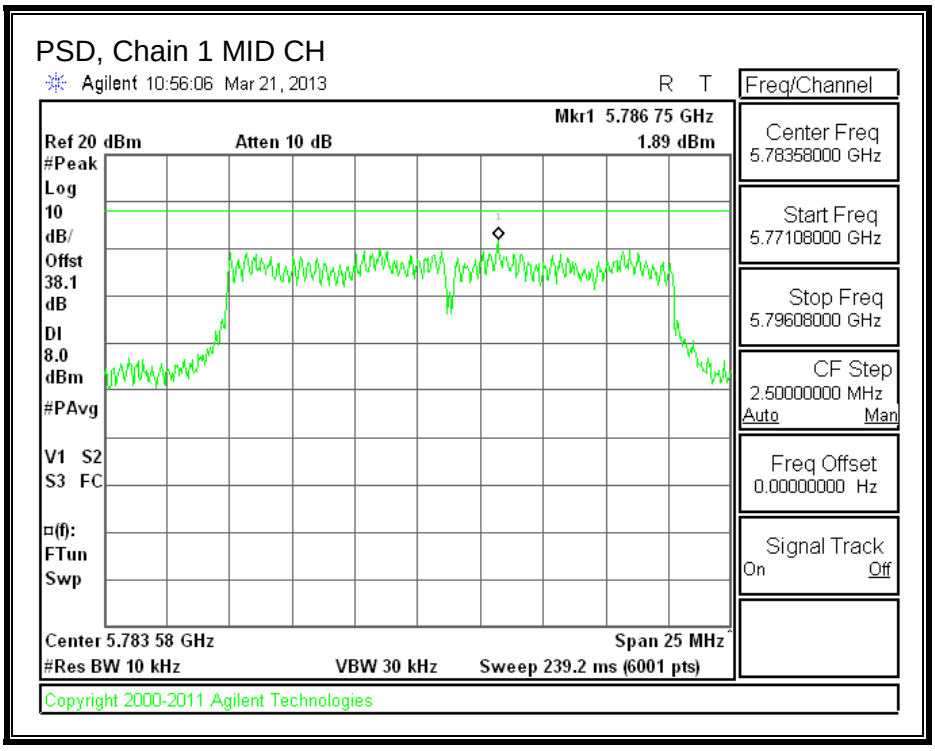




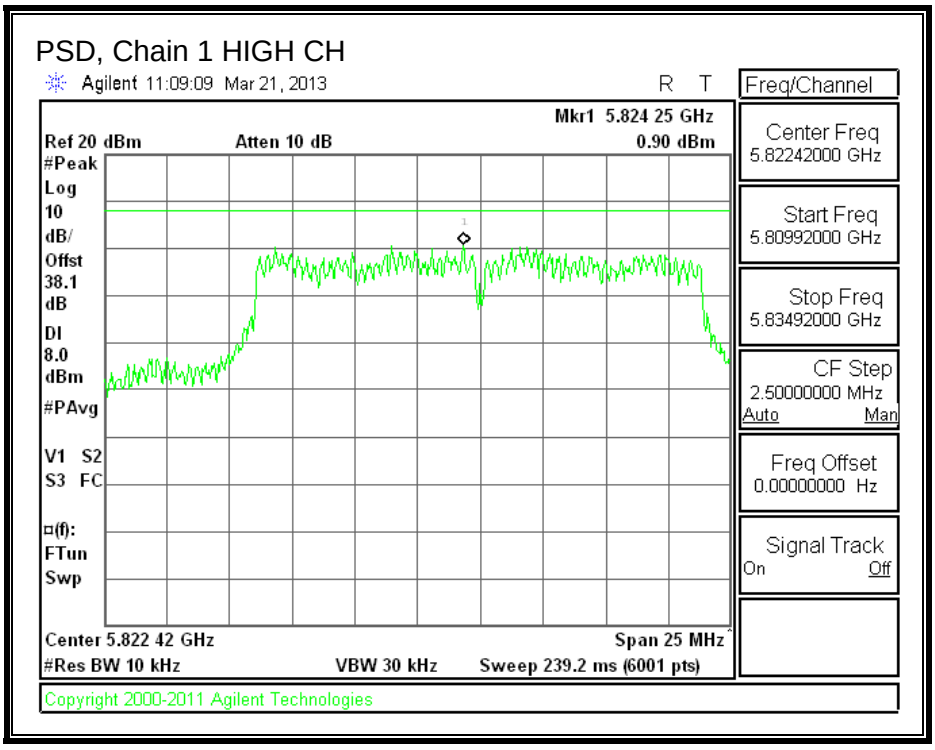
PSD, Chain 1



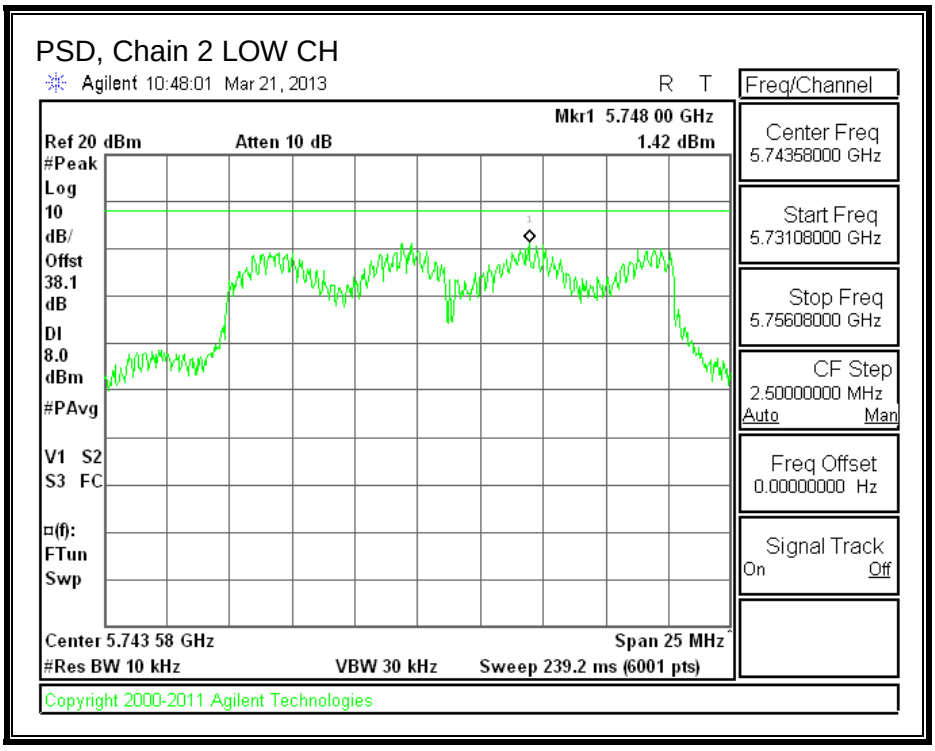
PSD, Chain 1 MID CH

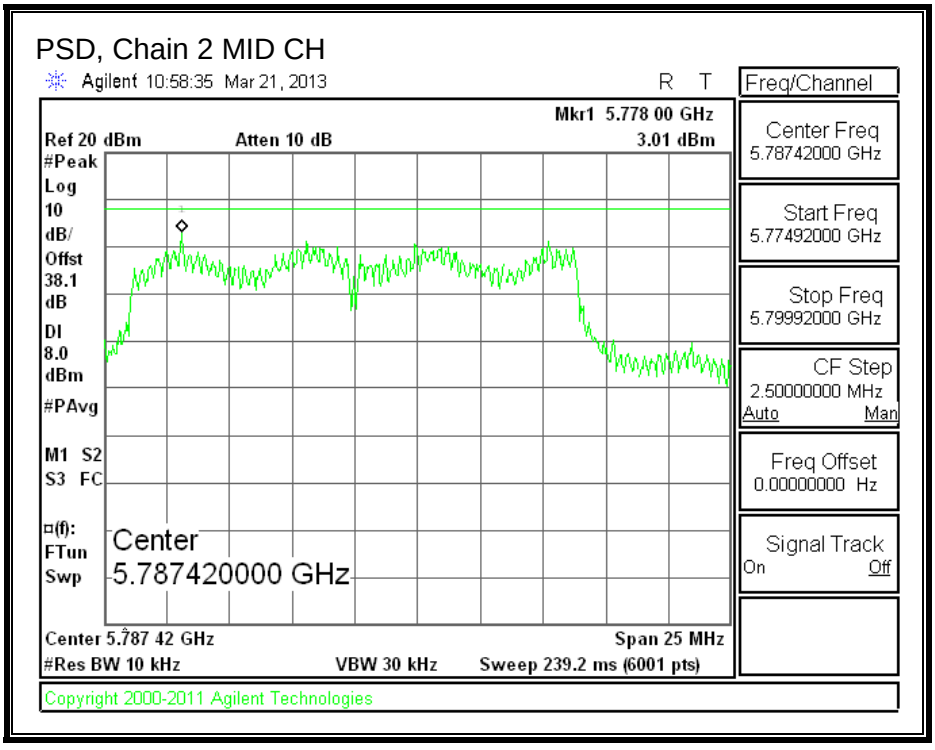


PSD, Chain 1 HIGH CH

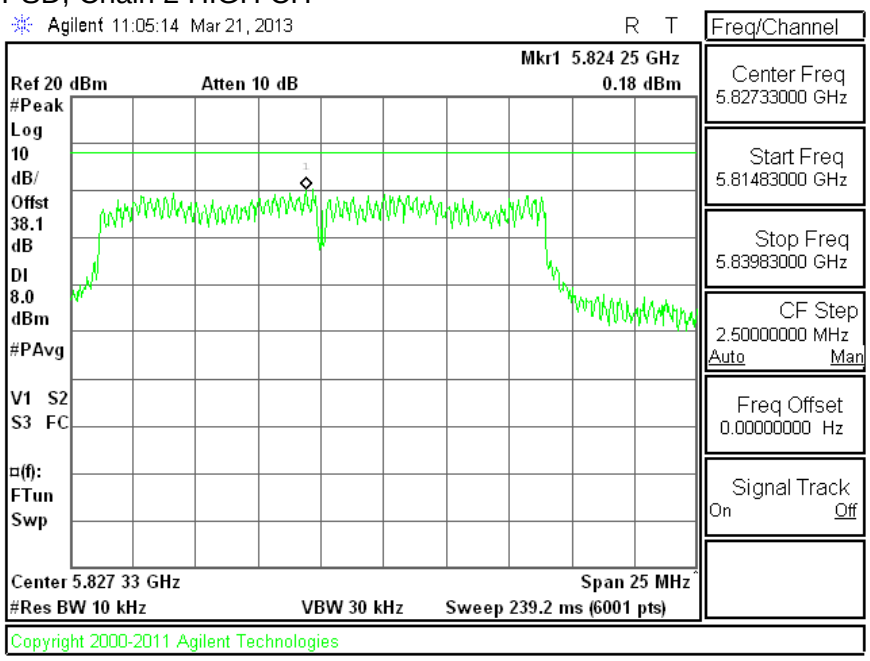


PSD, Chain 2





PSD, Chain 2 HIGH CH



8.17.5. OUT-OF-BAND EMISSIONS

LIMITS

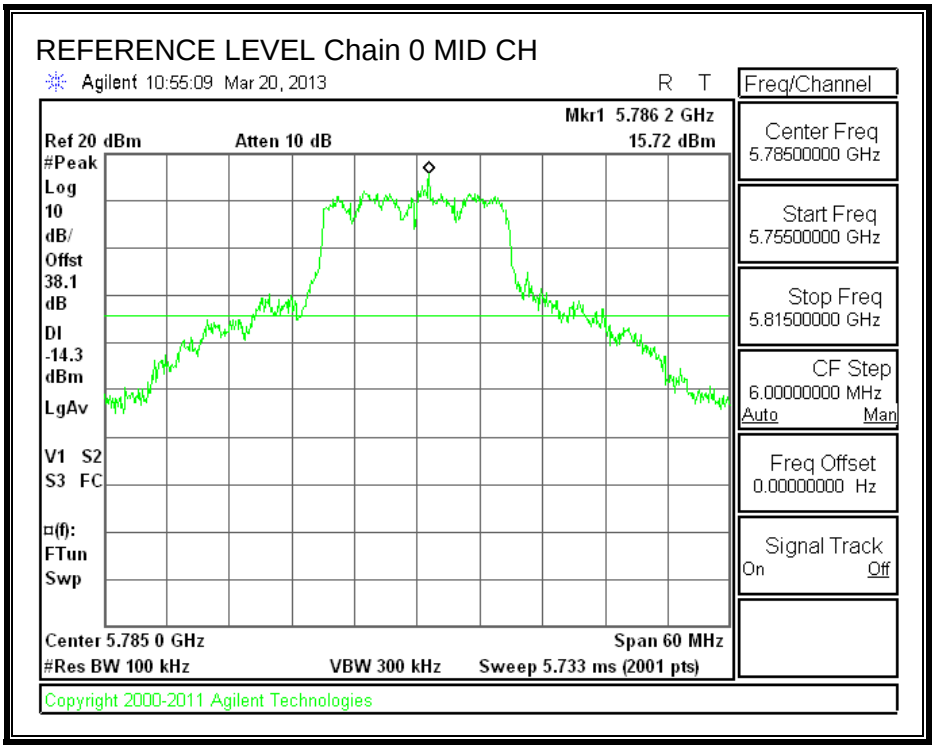
FCC §15.247 (d)

IC RSS-210 A8.5

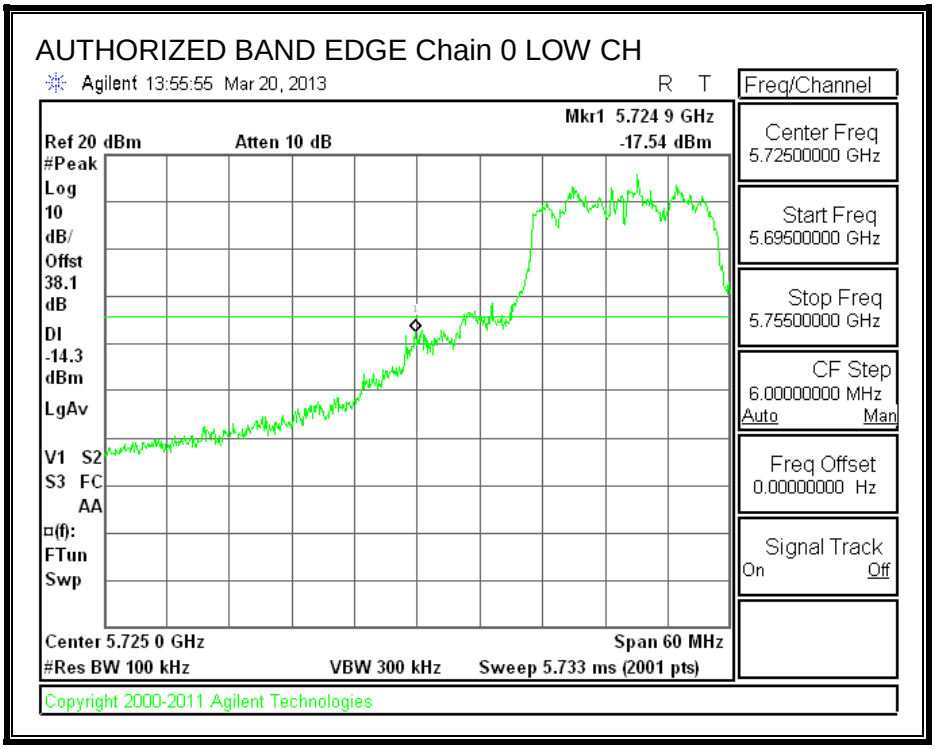
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

RESULTS

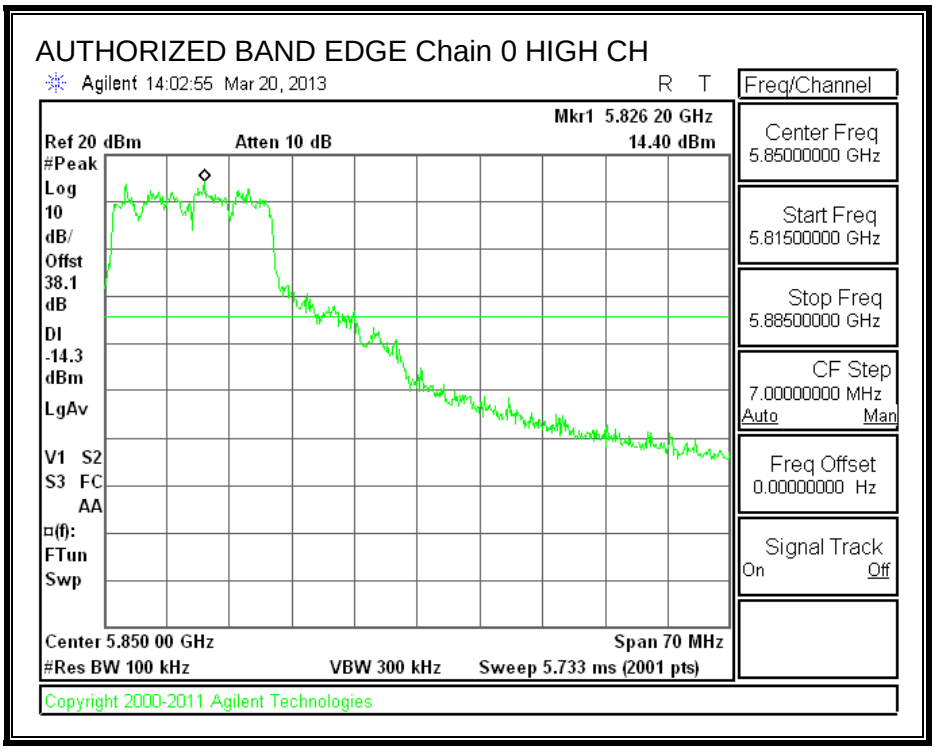
IN-BAND REFERENCE LEVEL, Chain 0



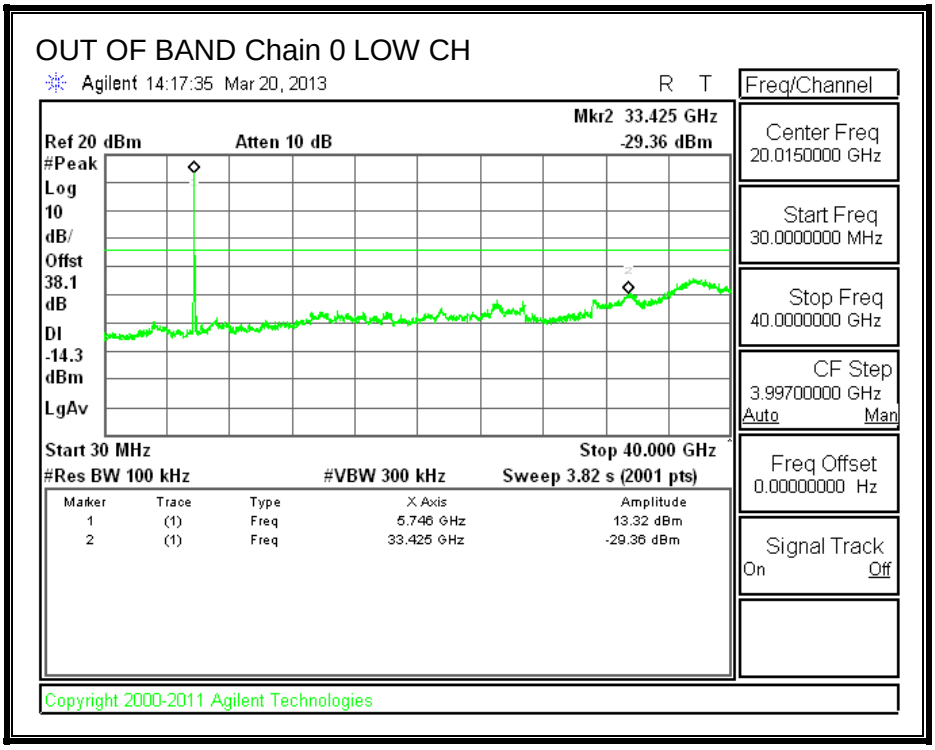
LOW CHANNEL BANDEDGE, Chain 0

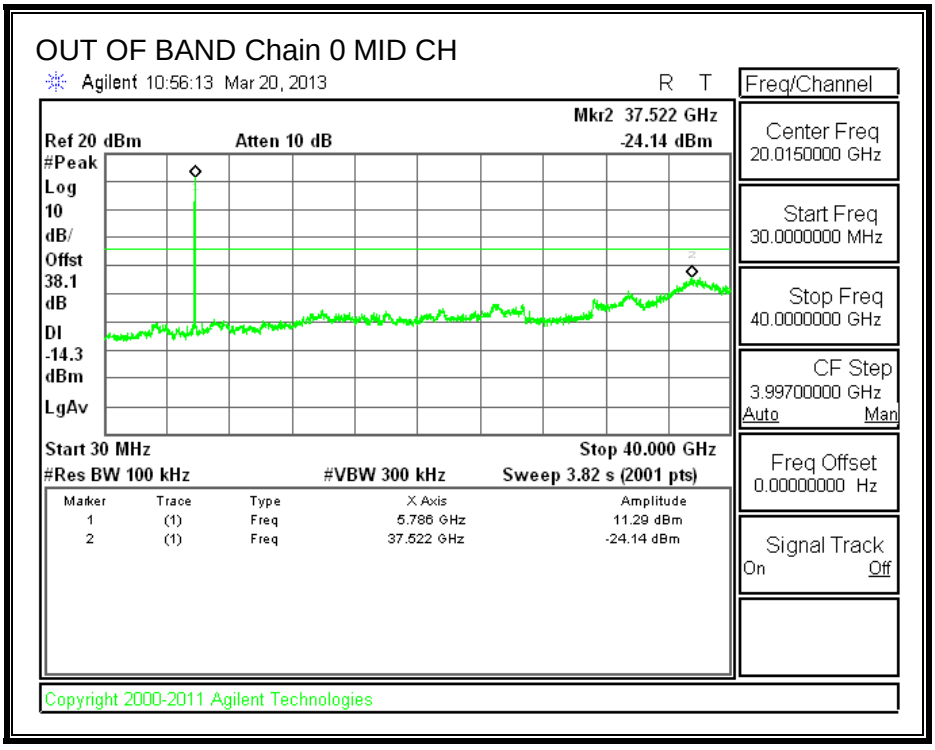


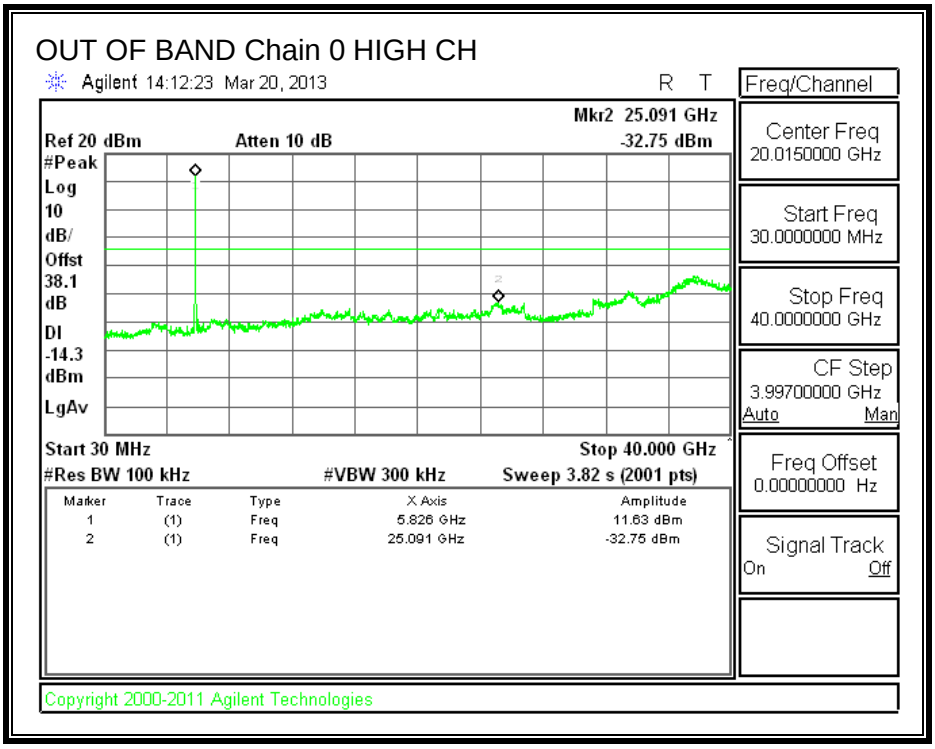
HIGH CHANNEL BANDEDGE, Chain 0



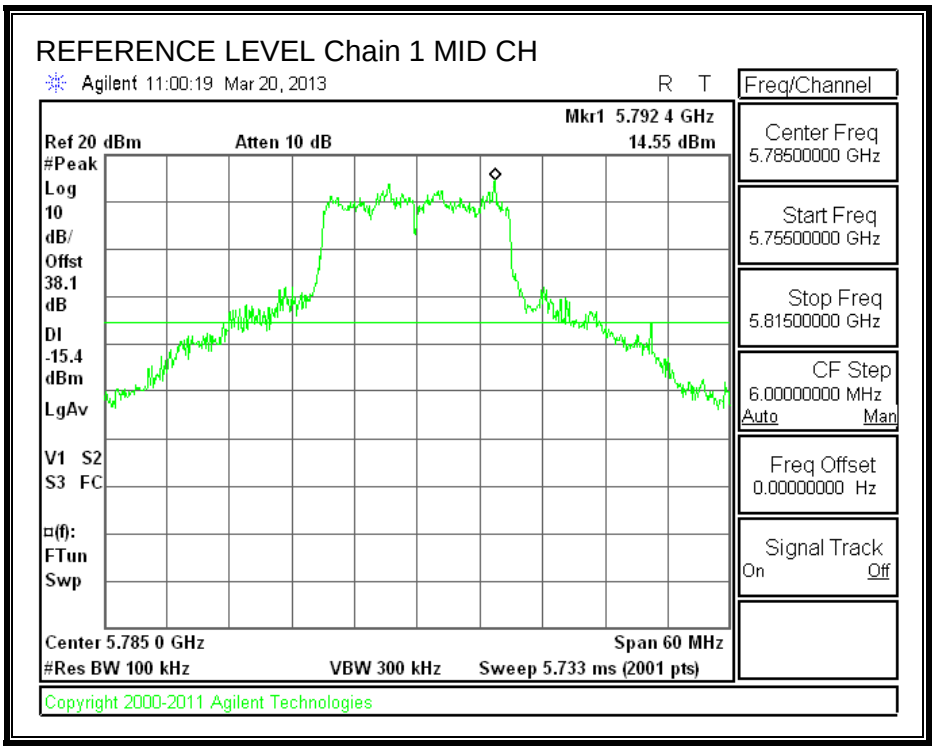
OUT-OF-BAND EMISSIONS, Chain 0



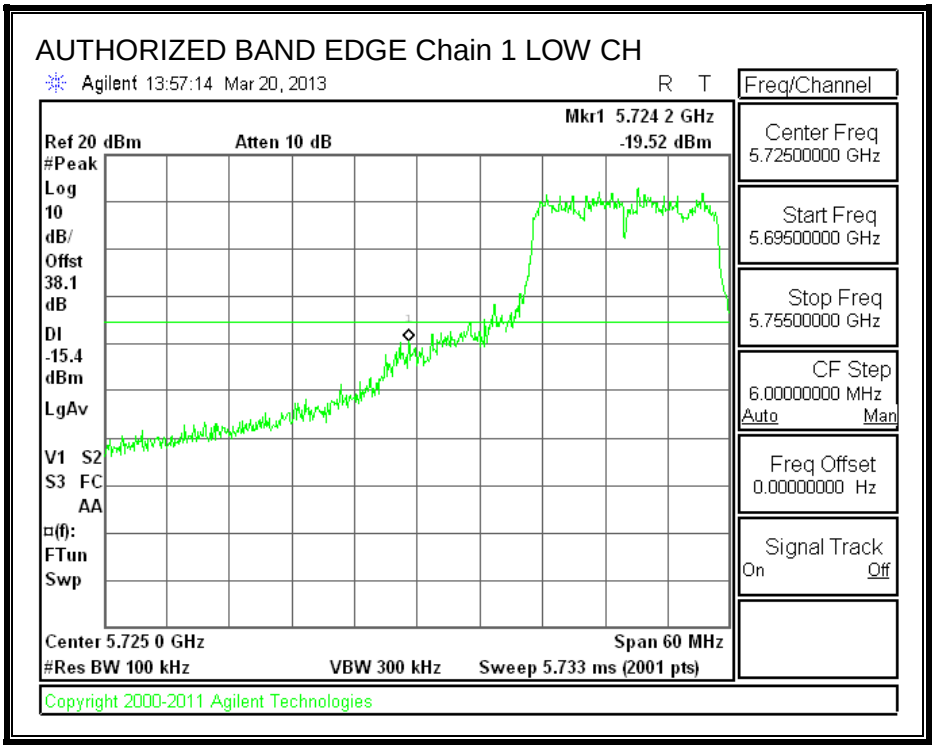




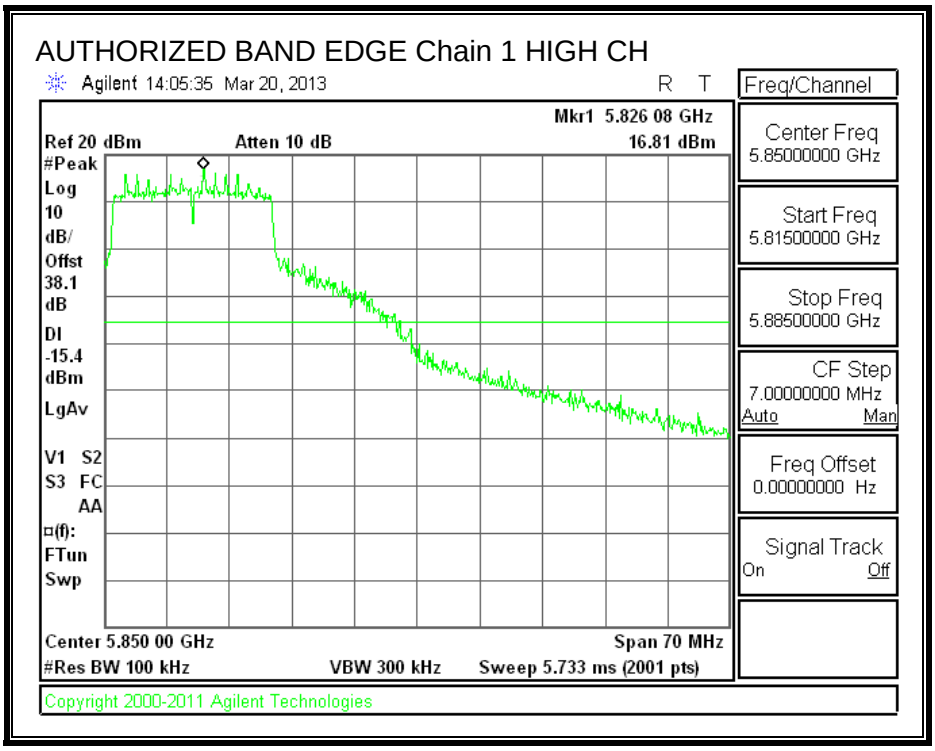
IN-BAND REFERENCE LEVEL, Chain 1



LOW CHANNEL BANDEDGE, Chain 1

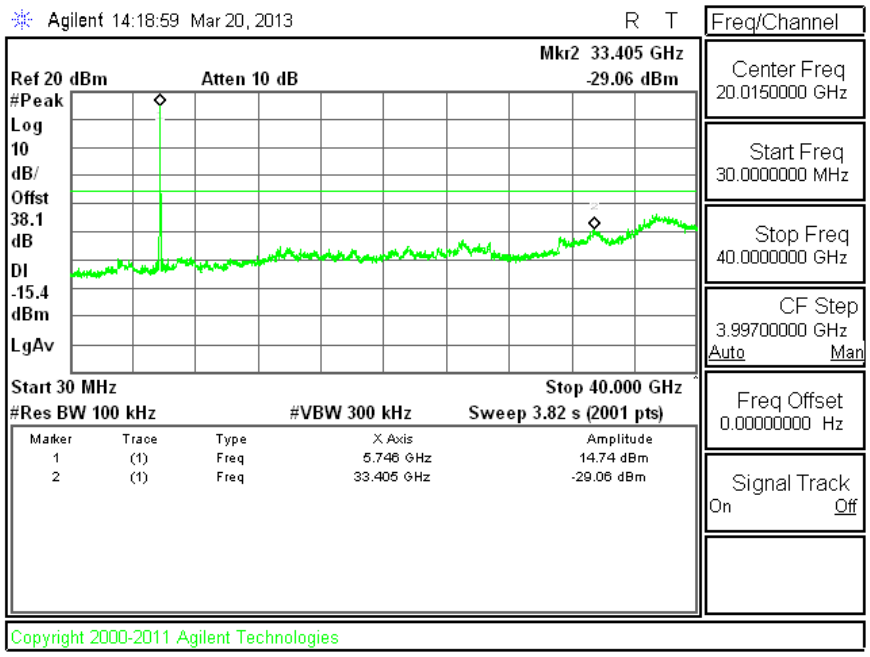


HIGH CHANNEL BANDEDGE, Chain 1

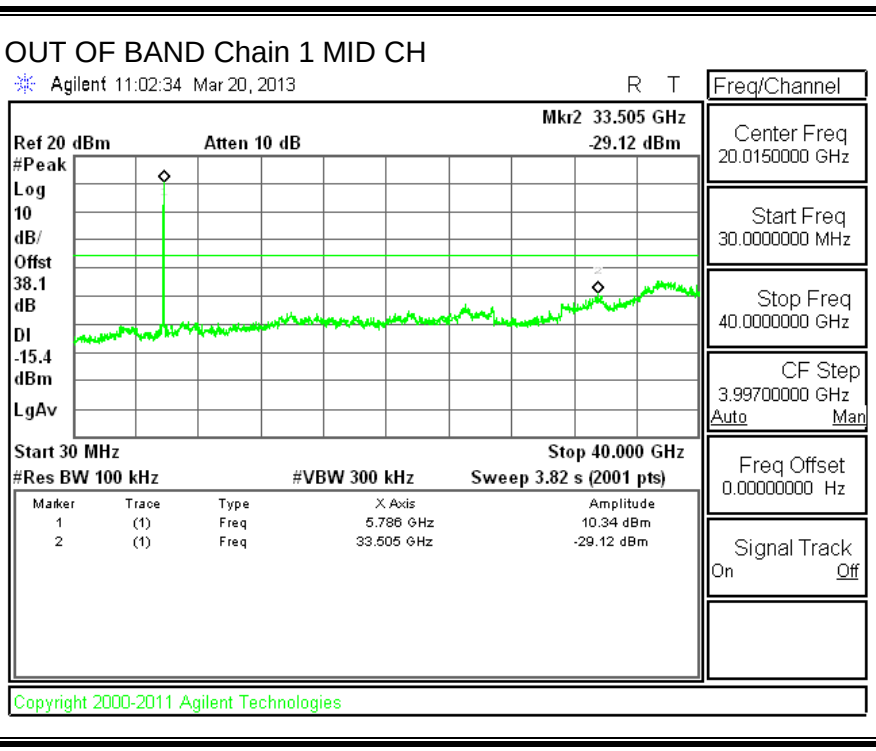


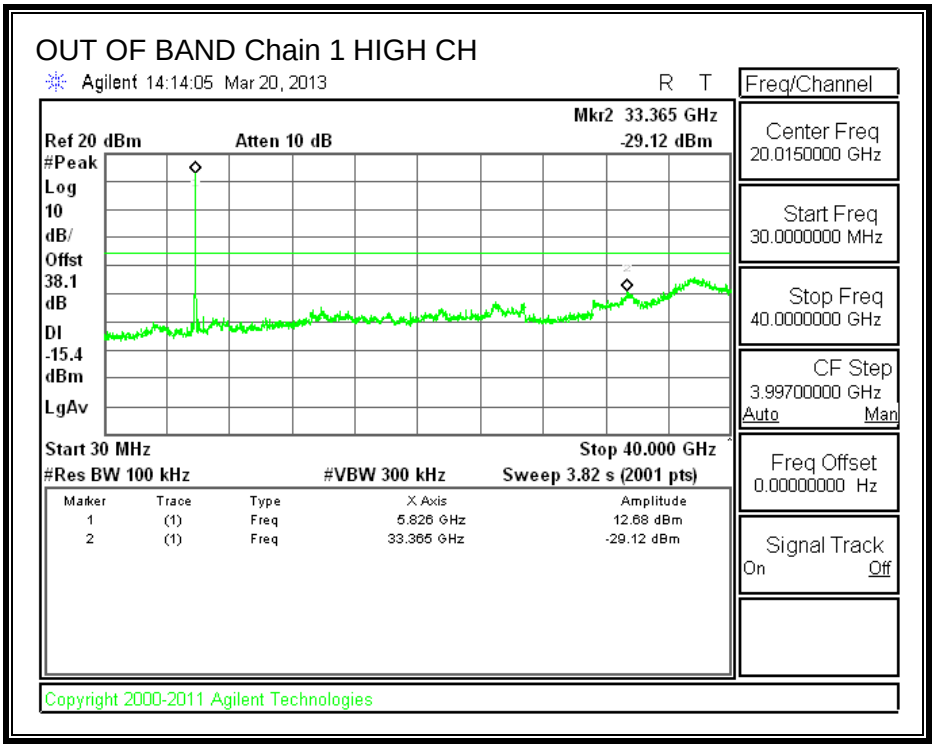
OUT-OF-BAND EMISSIONS, Chain 1

OUT OF BAND Chain 1 LOW CH

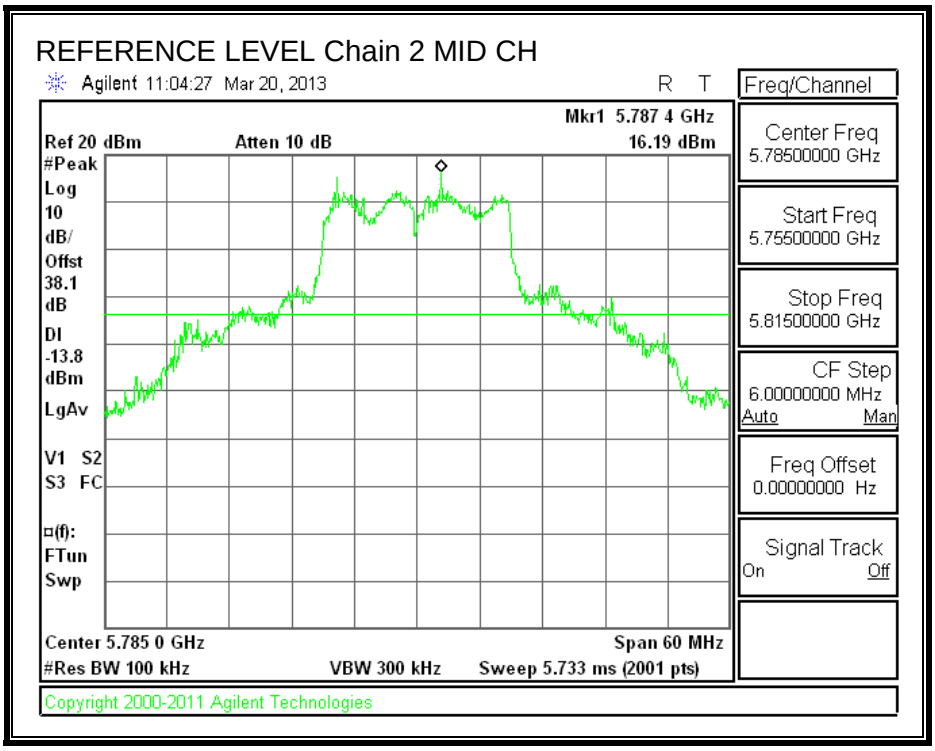


OUT OF BAND Chain 1 MID CH

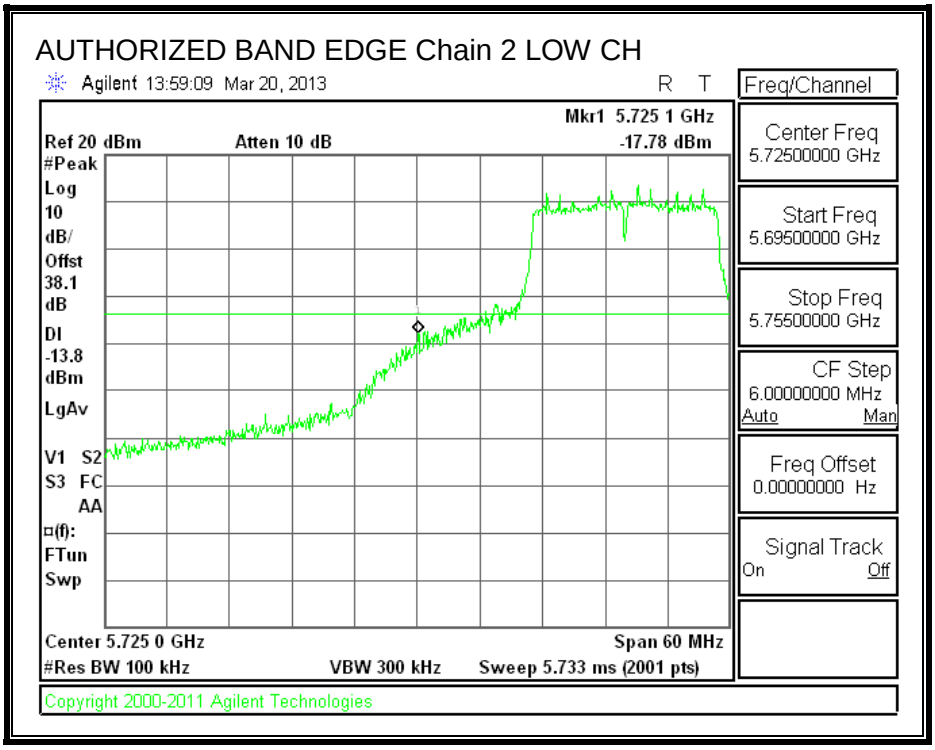




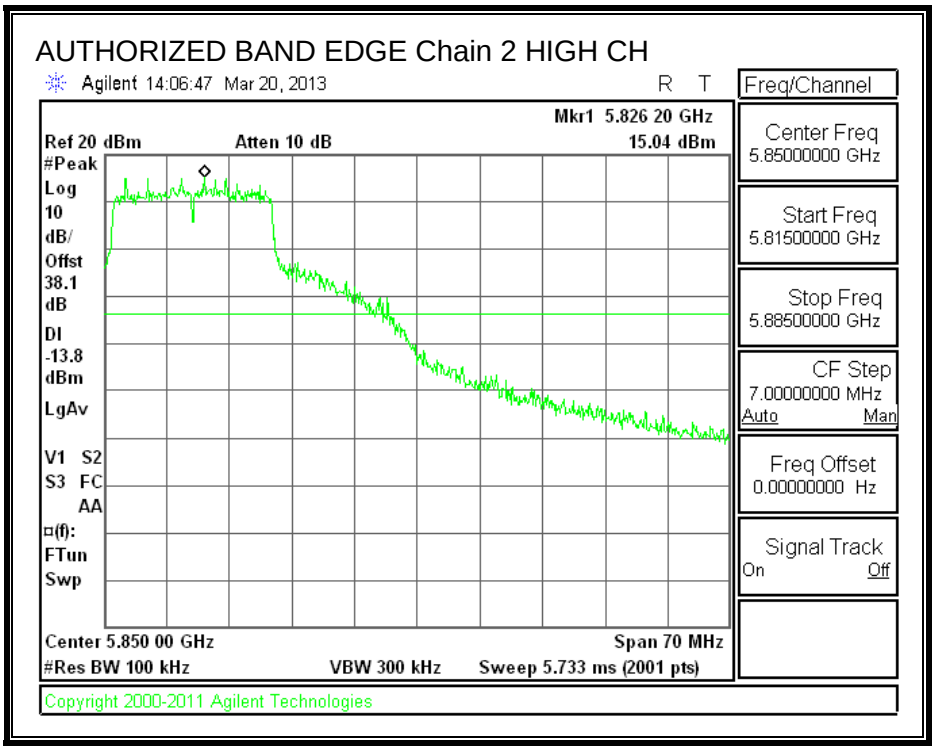
IN-BAND REFERENCE LEVEL, Chain 2



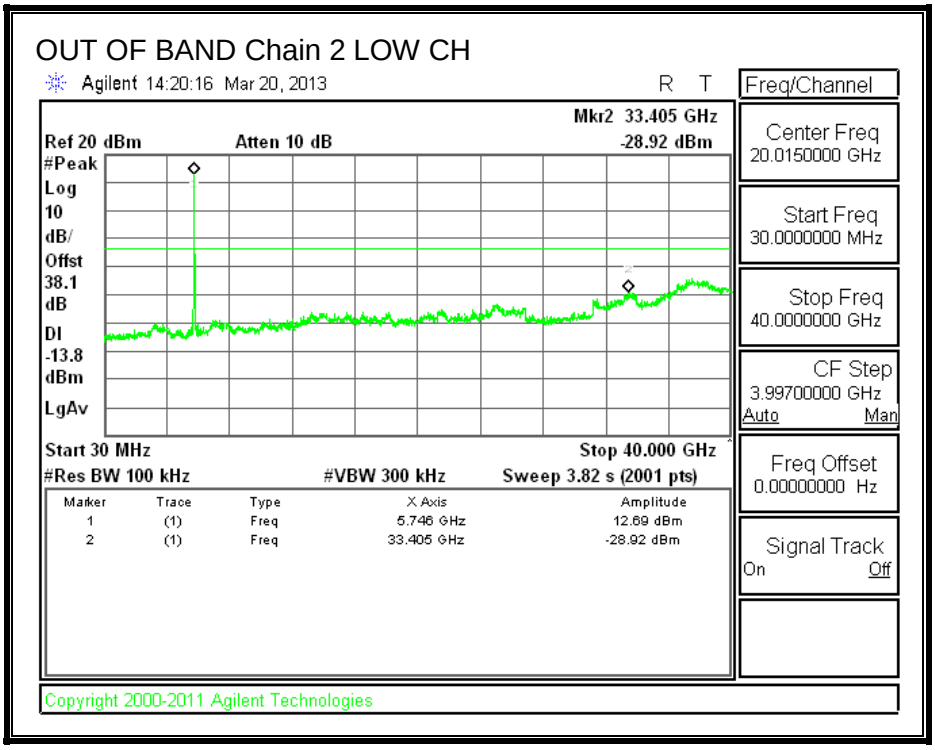
LOW CHANNEL BANDEDGE, Chain 2

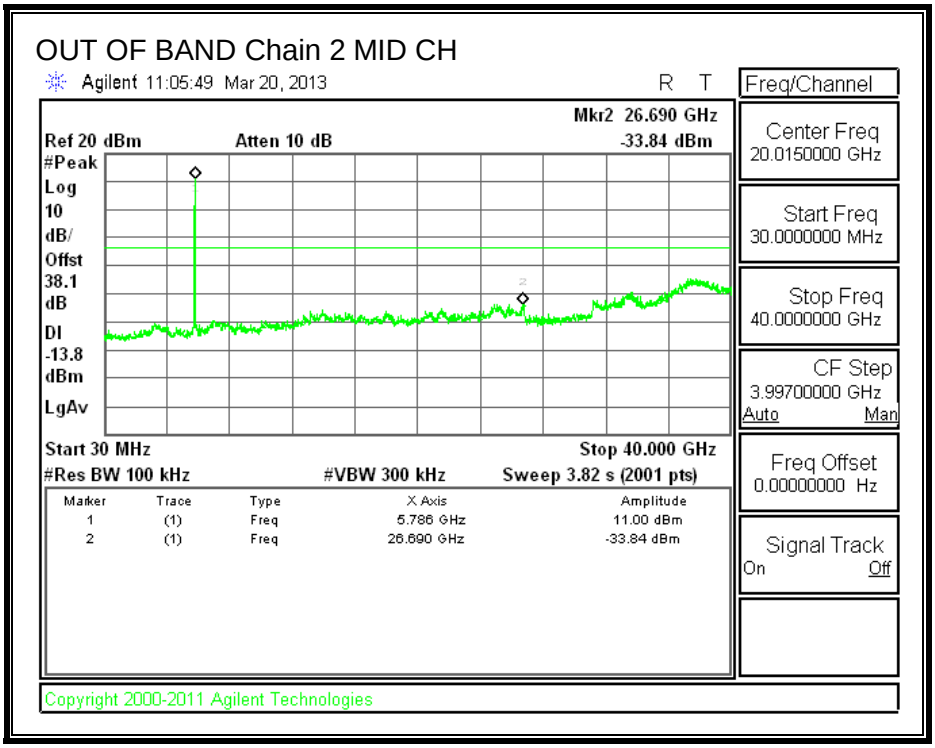


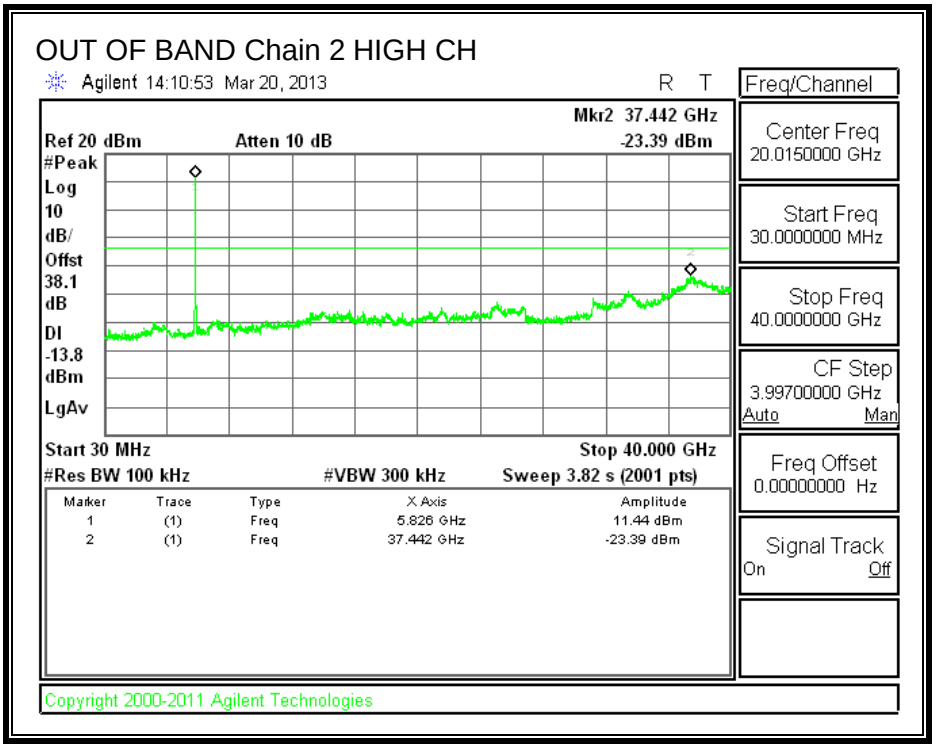
HIGH CHANNEL BANDEDGE, Chain 2



OUT-OF-BAND EMISSIONS, Chain 2







8.18. 802.11n HT40 1TX MODE IN THE 5.8 GHz BAND

Covered by testing 11n HT40 CDD 3TX, power per chain used in the 802.11n HT40 CDD 3TX mode is equal to the power per chain that will be used for 802.11n HT40 1TX.

8.19. 802.11n HT40 CDD 2TX MODE IN THE 5.8 GHz BAND

Covered by testing 11n HT40 CDD 3TX, power per chain used in the 802.11n HT40 CDD 3TX mode is equal to the power per chain that will be used for 802.11n HT40 2TX.

8.20. 802.11n HT40 CDD 3TX MODE IN THE 5.8 GHz BAND

8.20.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

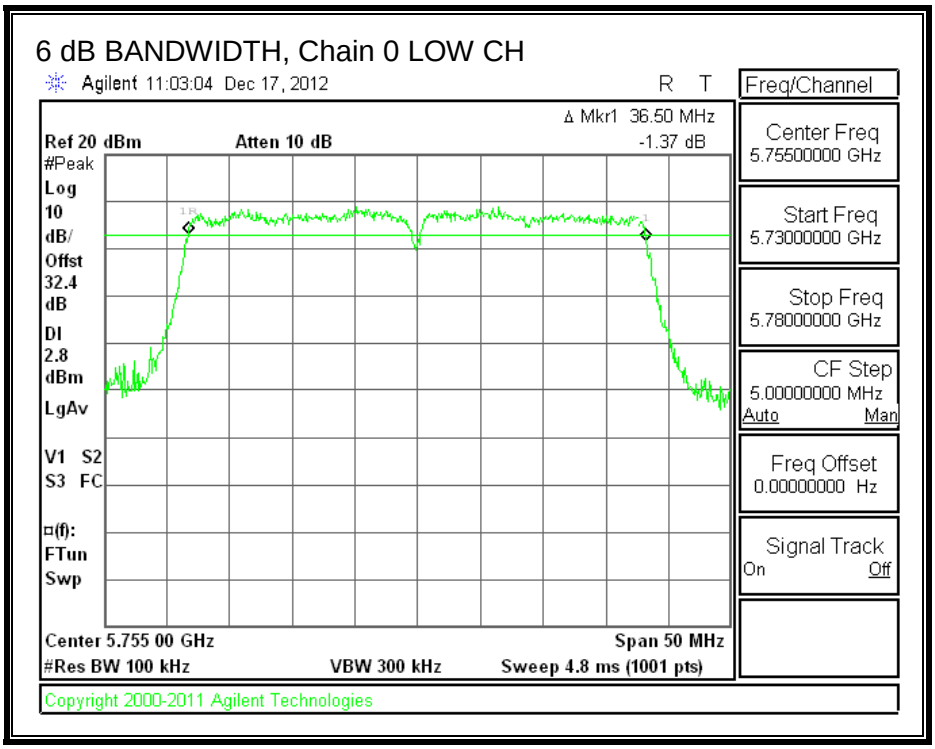
IC RSS-210 A8.2 (a)

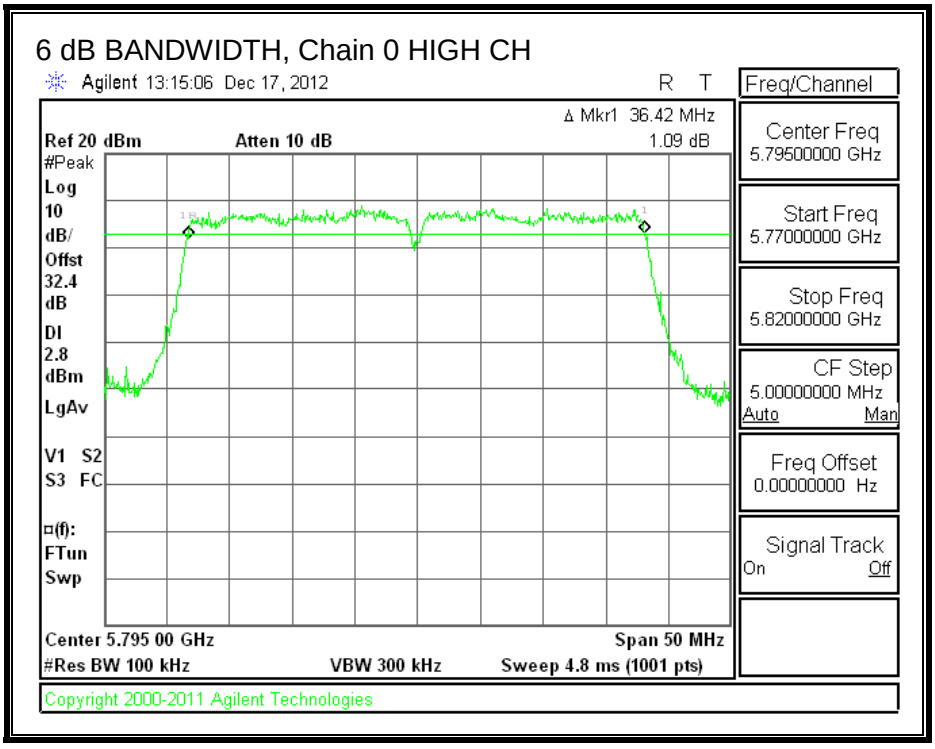
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

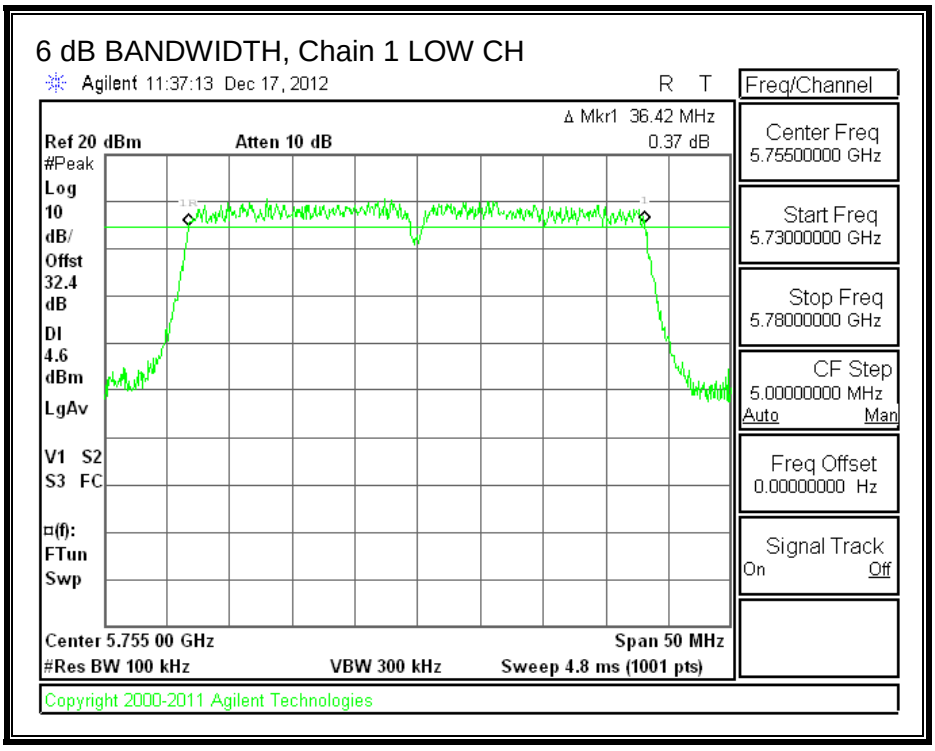
Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	6 dB BW Chain 2 (MHz)	Minimum Limit (MHz)
Low	5755	36.50	36.42	36.50	0.5
High	5795	36.42	36.42	36.42	0.5

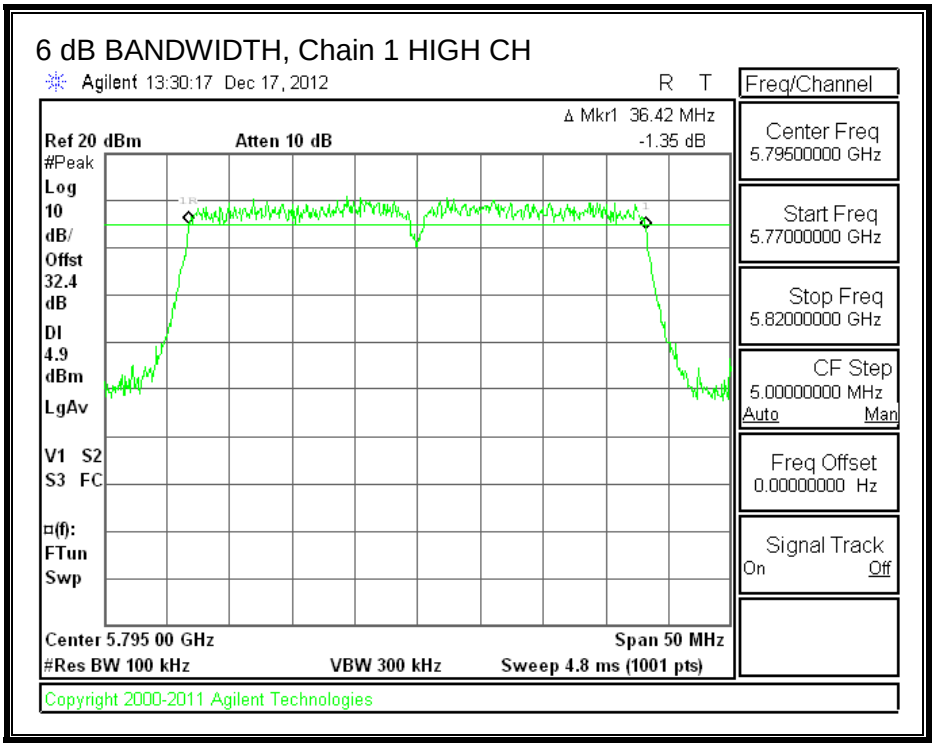
6 dB BANDWIDTH, Chain 0



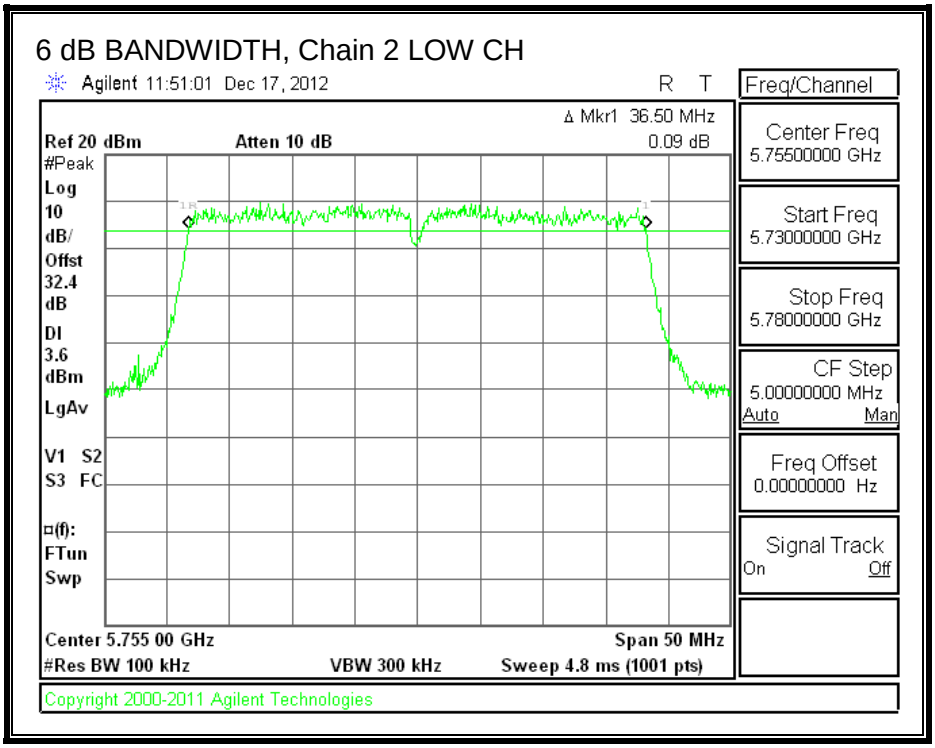


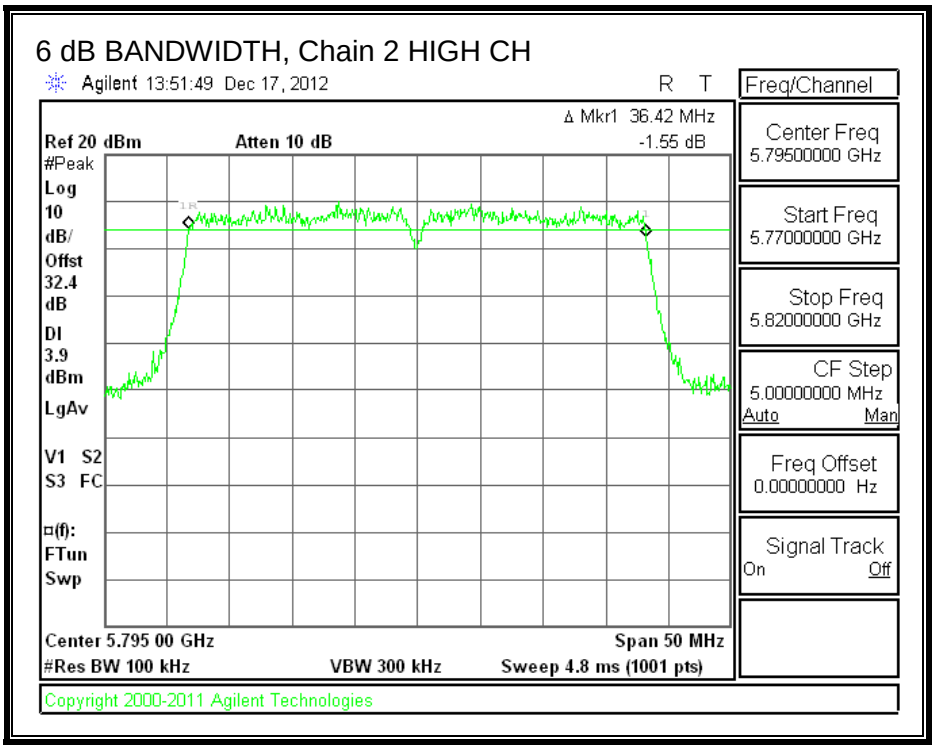
6 dB BANDWIDTH, Chain 1





6 dB BANDWIDTH, Chain 2





8.20.2. 99% BANDWIDTH

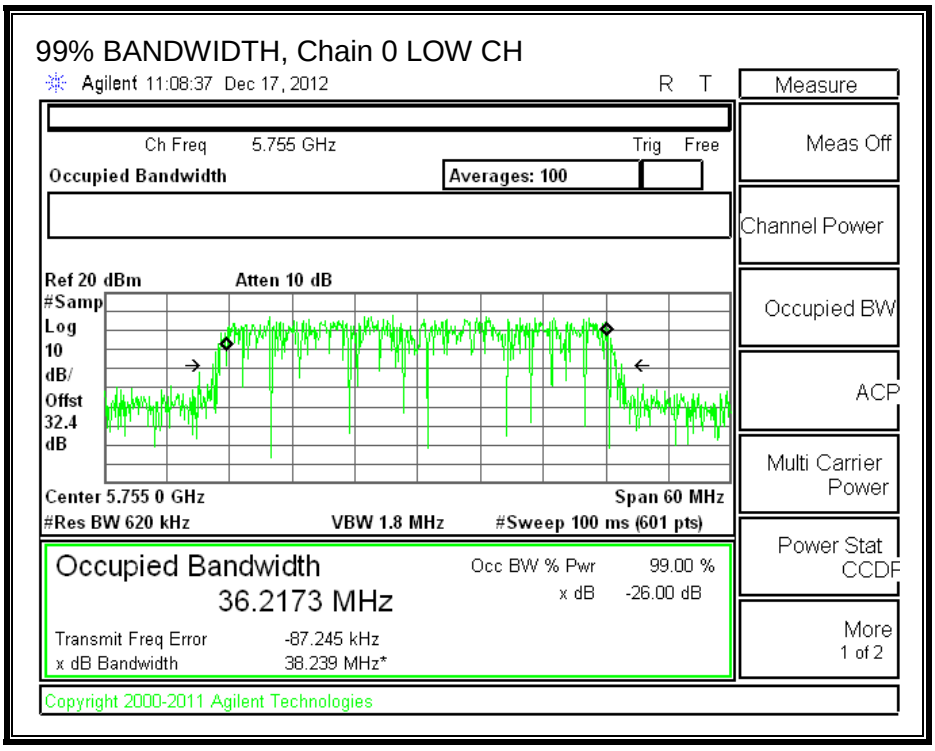
LIMITS

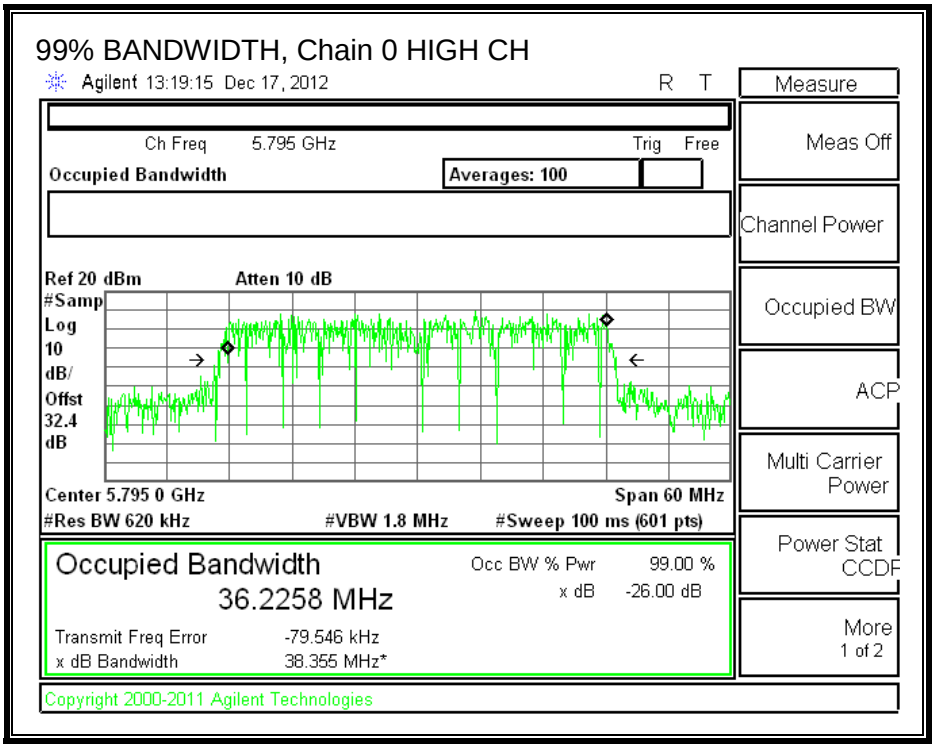
None; for reporting purposes only.

RESULTS

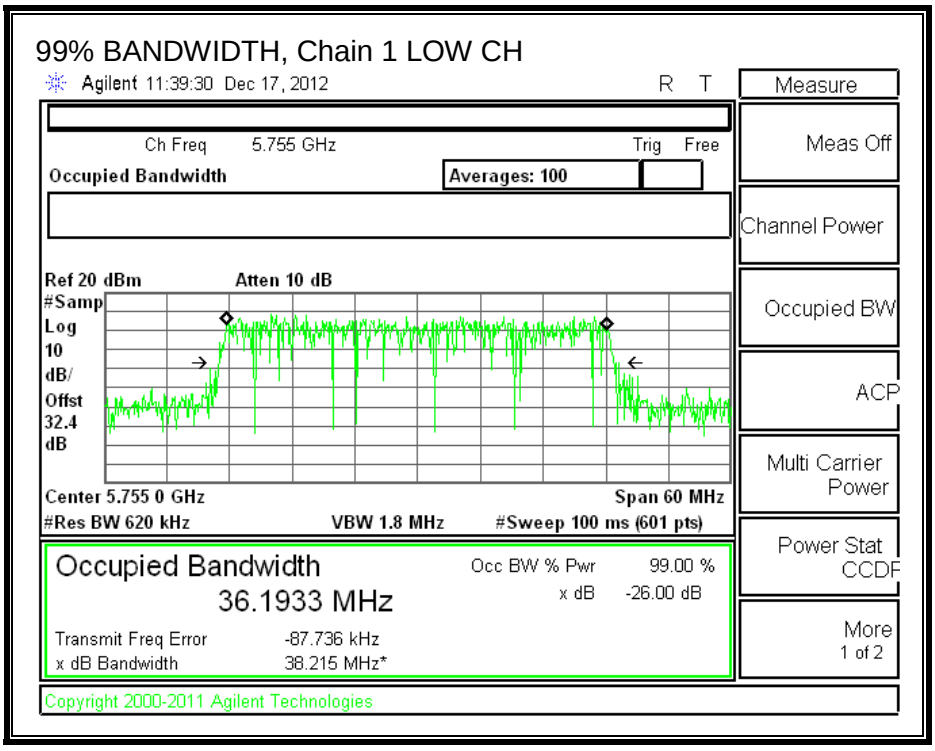
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Low	5755	36.2173	36.1933	36.2157
High	5795	36.2258	36.1984	36.1431

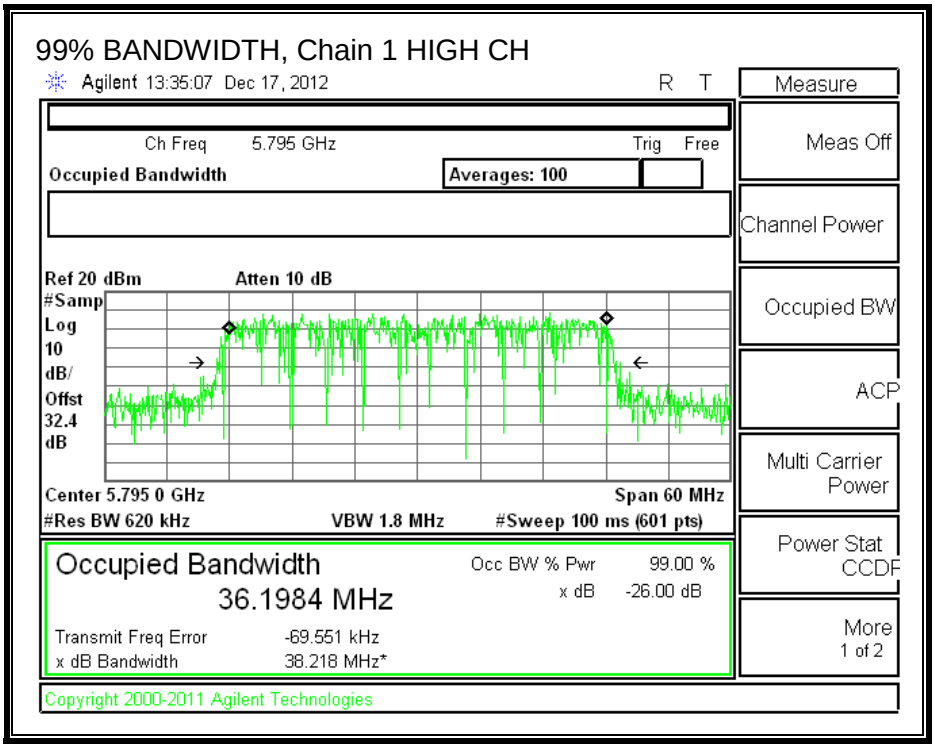
99% BANDWIDTH, Chain 0



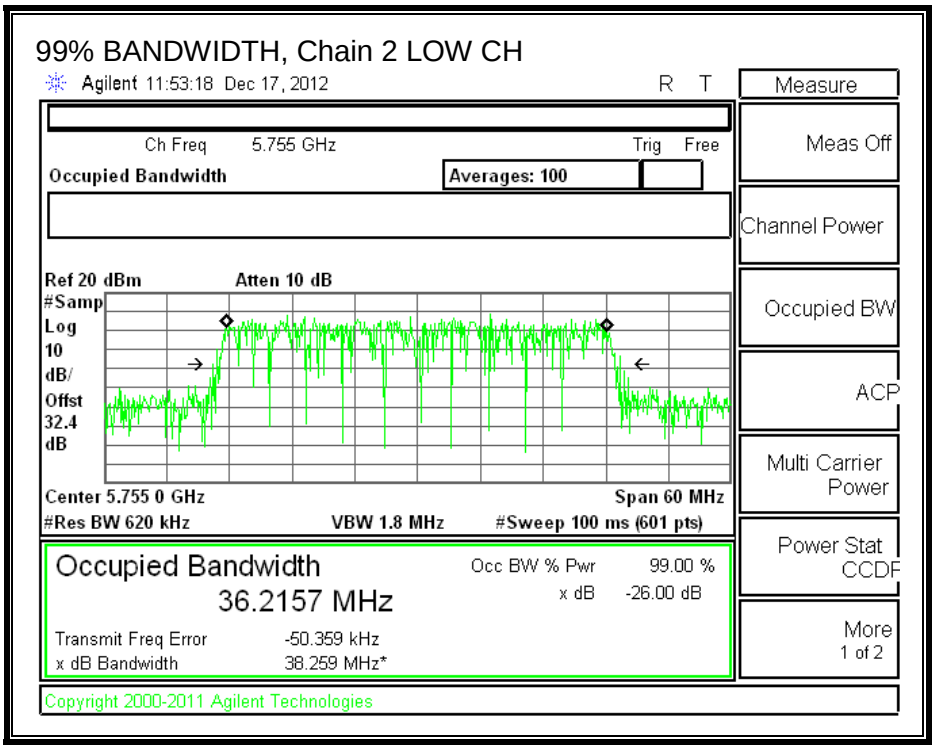


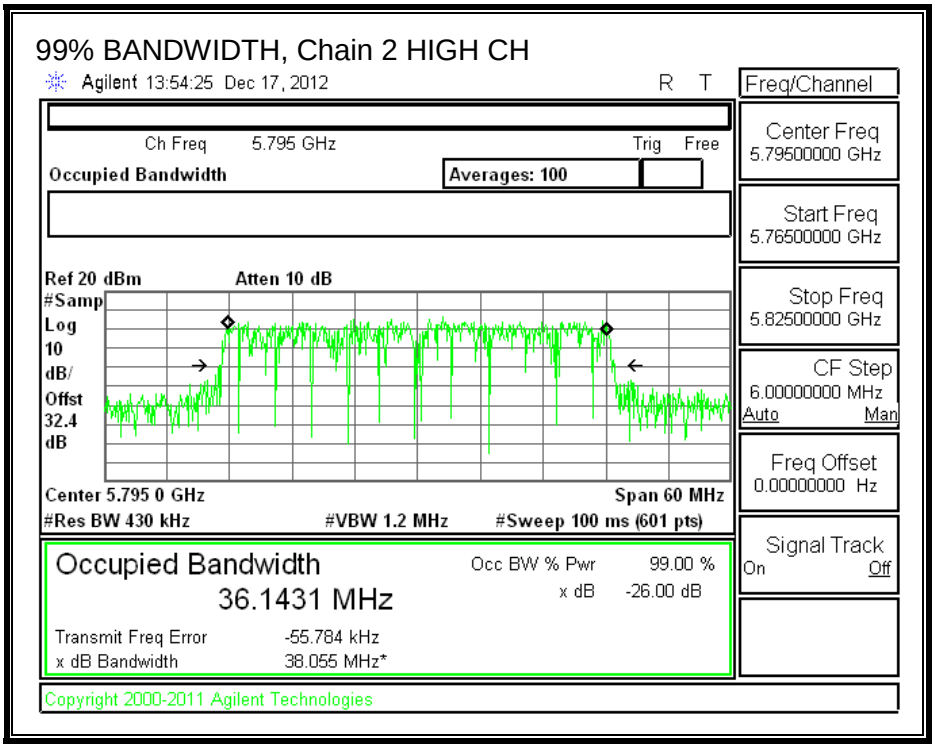
99% BANDWIDTH, Chain 1





99% BANDWIDTH, Chain 2





8.20.3. OUTPUT AVERAGE POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
2.70	1.90	4.40	3.13

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	5755	3.13	30.00	30	36	30.00
High	5795	3.13	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	5755	20.40	20.80	20.50	25.34	30.00	-4.66
High	5795	24.30	24.50	24.40	29.17	30.00	-0.83

8.20.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247

IC RSS-210 A8.2

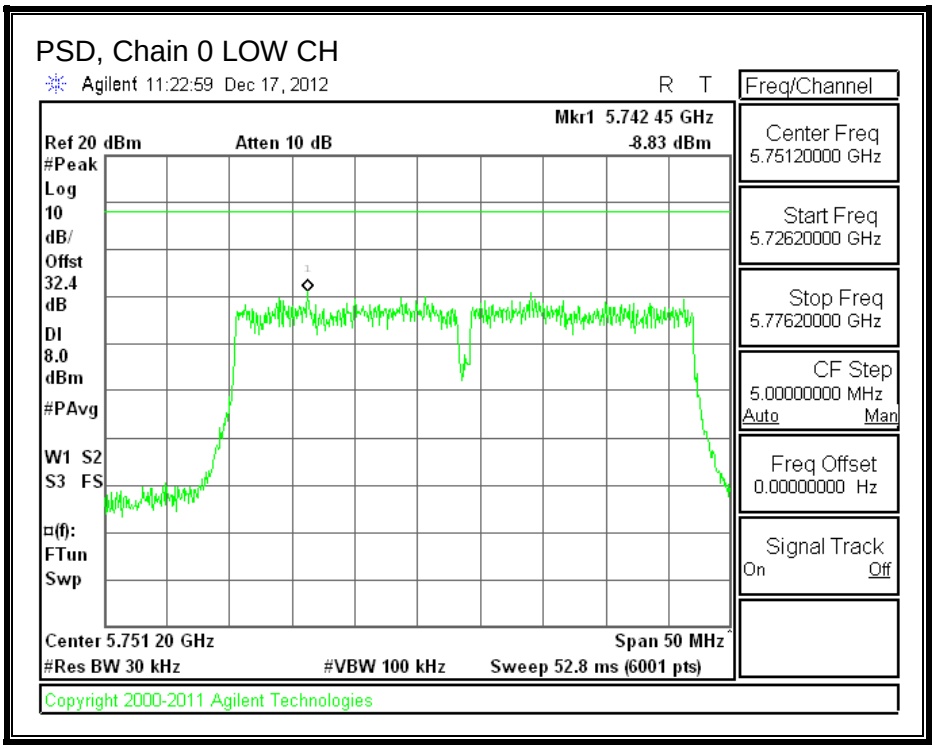
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

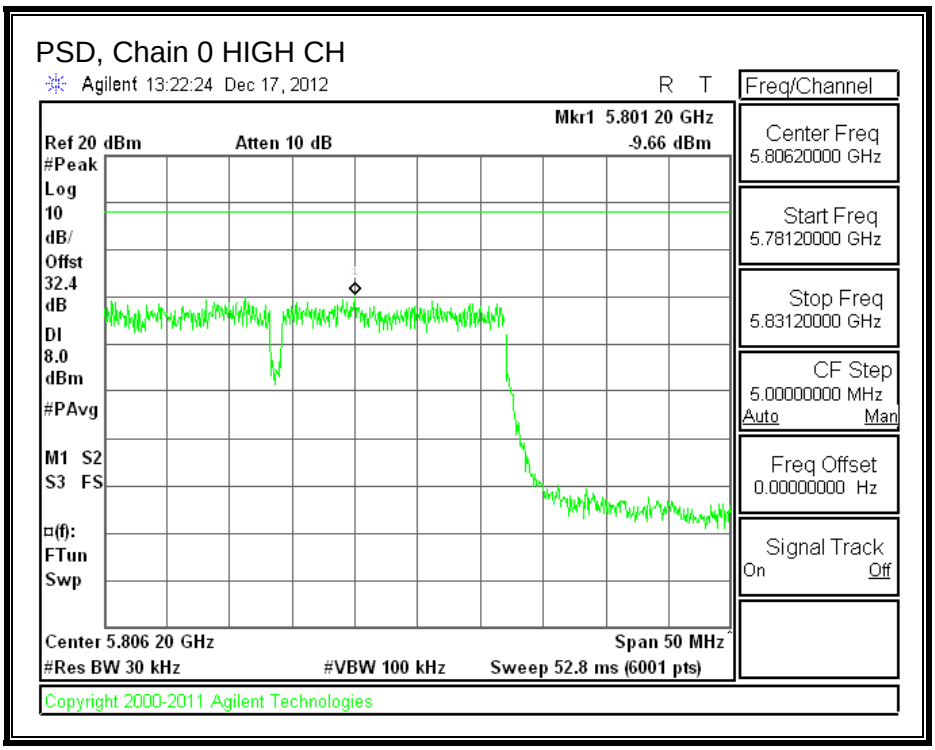
RESULTS

PSD Results

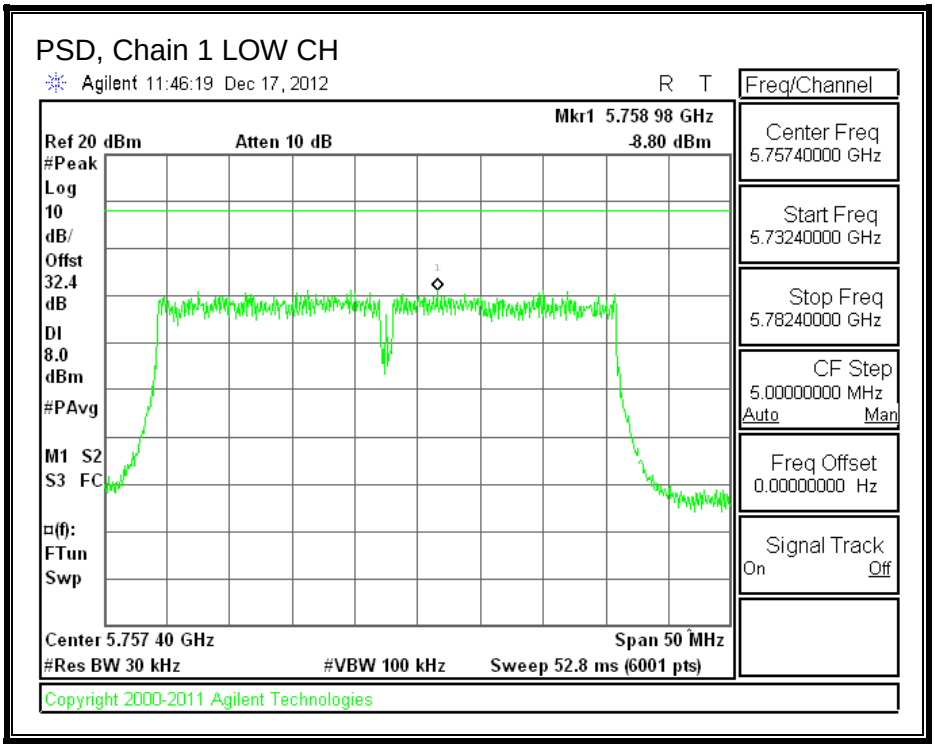
Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Chain 2 Meas (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	5755	-8.83	-8.80	-8.54	-3.95	8.0	-12.0
High	5795	-9.66	-8.25	-9.88	-4.43	8.0	-12.4

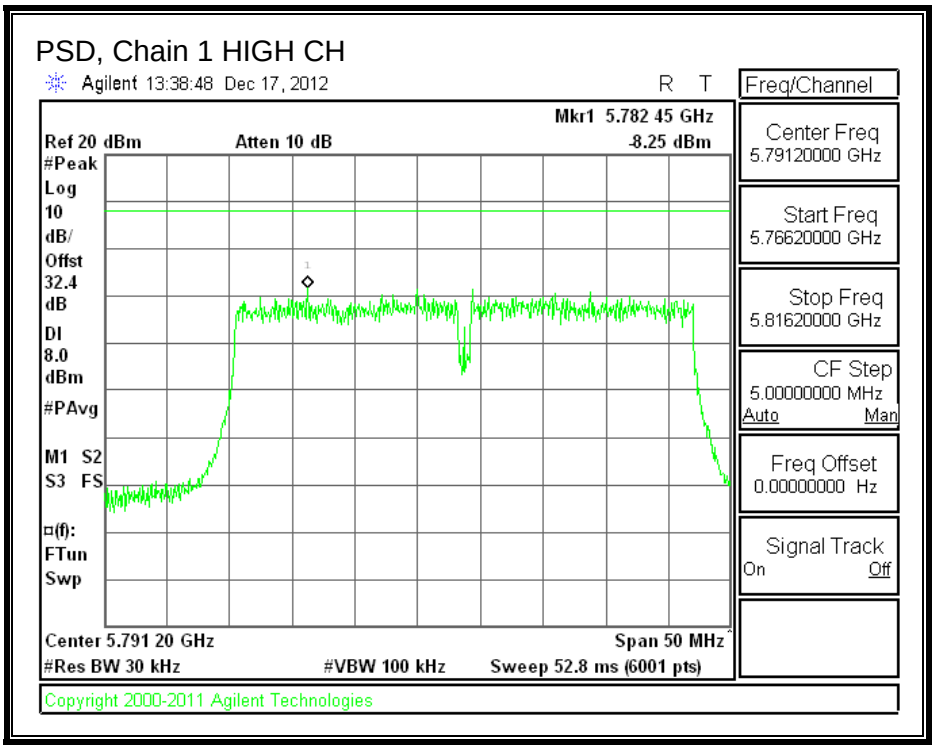
PSD, Chain 0





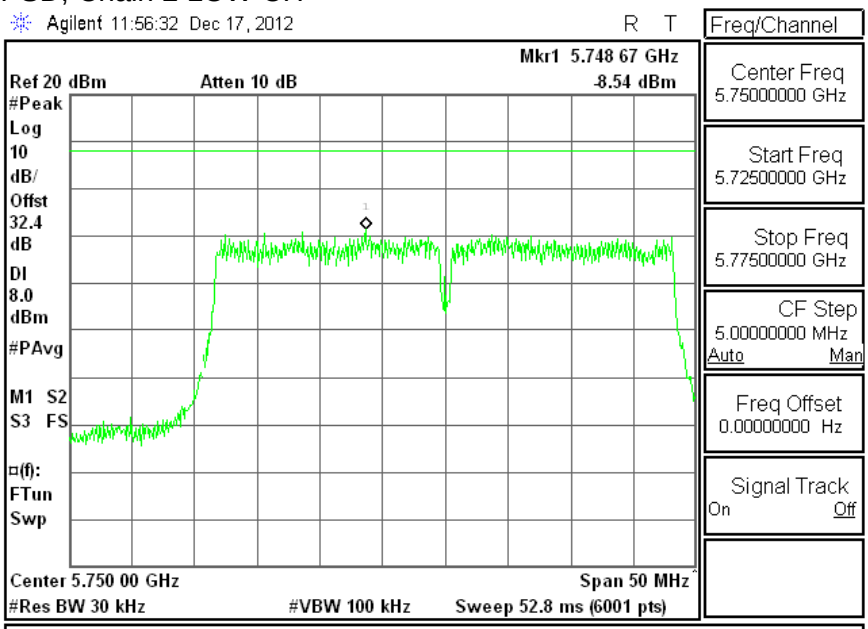
PSD, Chain 1



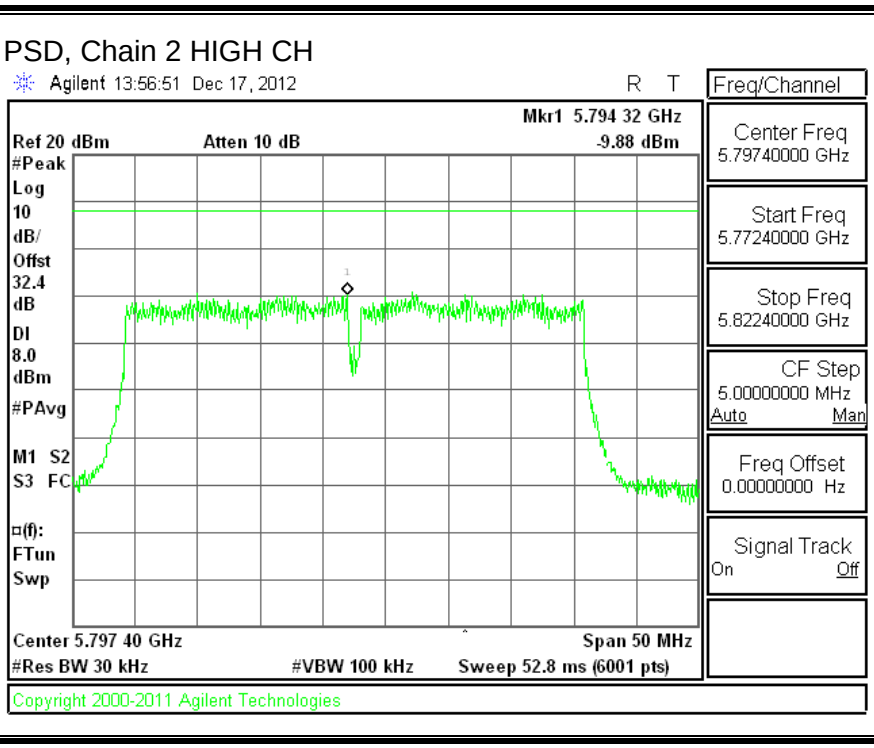


PSD, Chain 2

PSD, Chain 2 LOW CH



PSD, Chain 2 HIGH CH



8.20.5. OUT-OF-BAND EMISSIONS

LIMITS

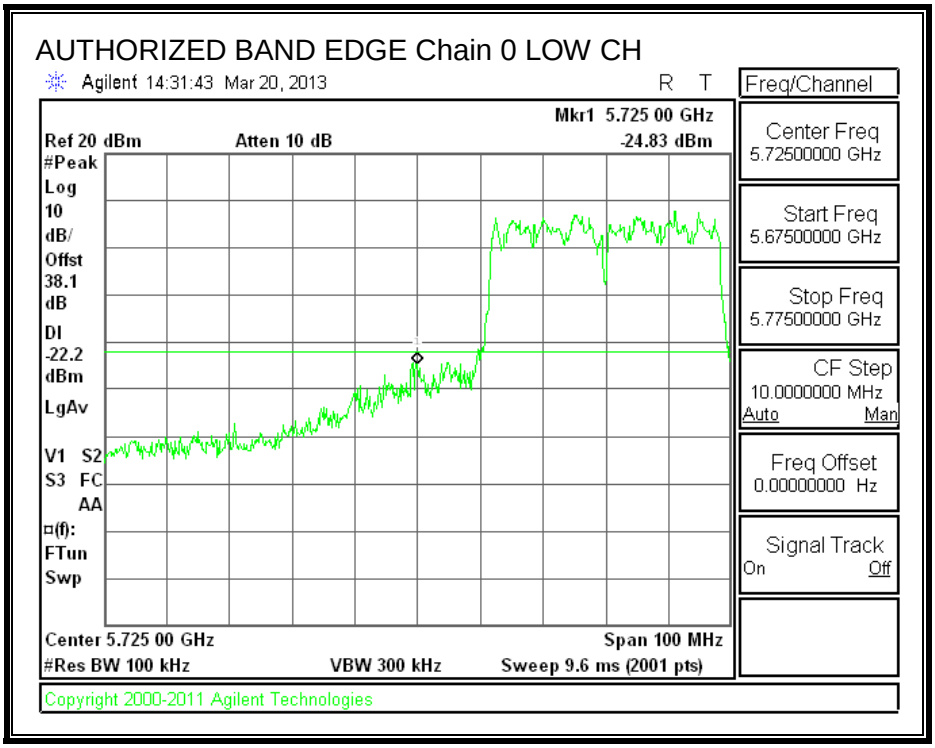
FCC §15.247 (d)

IC RSS-210 A8.5

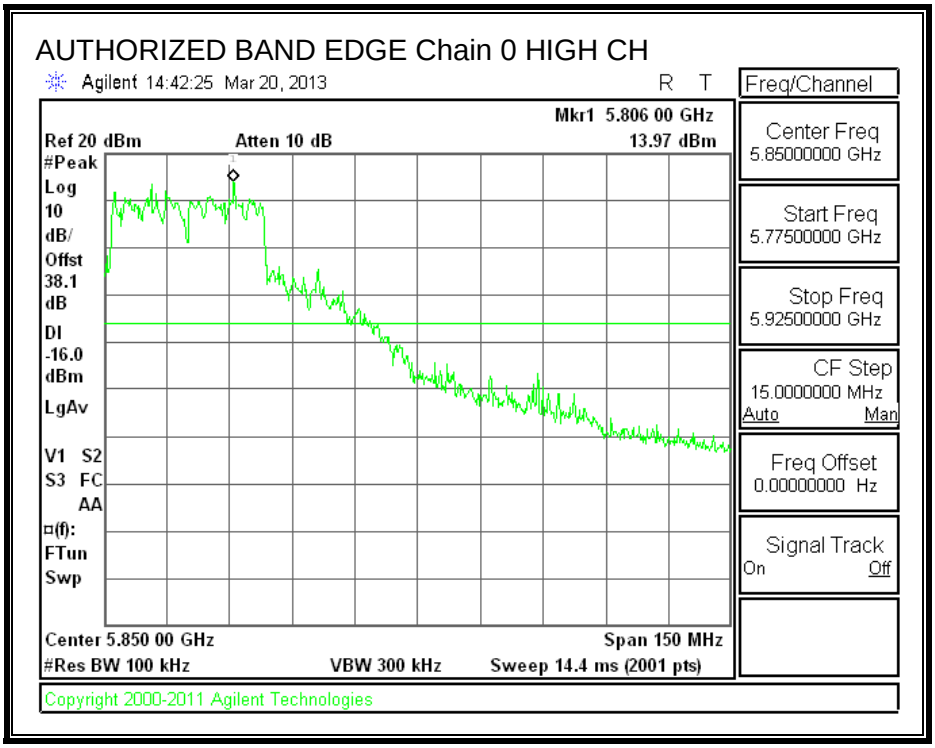
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

RESULTS

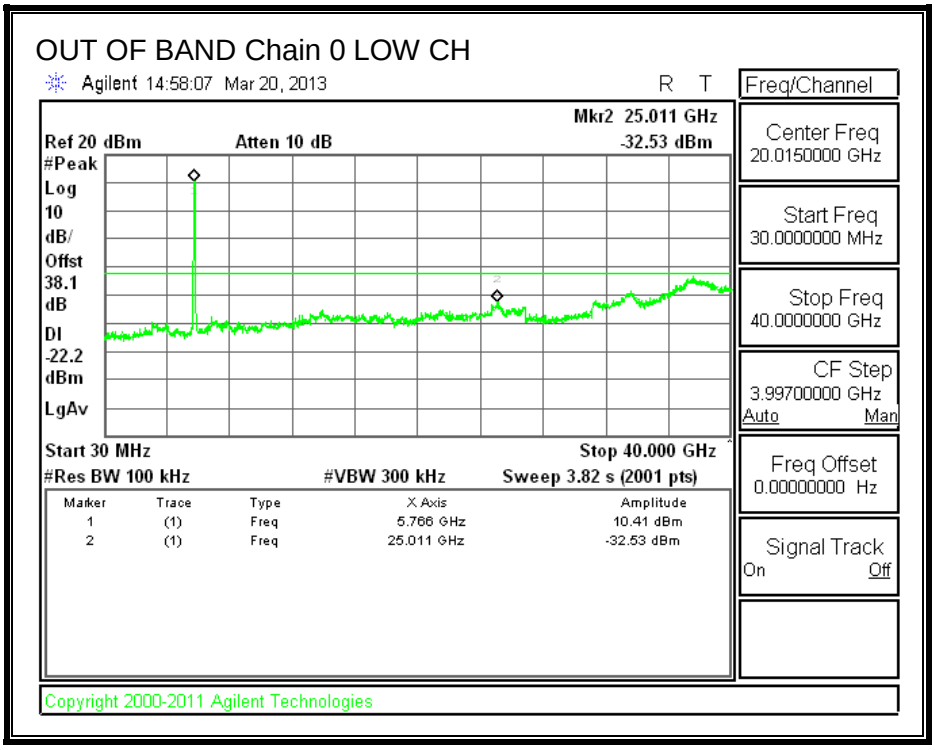
LOW CHANNEL BANDEDGE, Chain 0

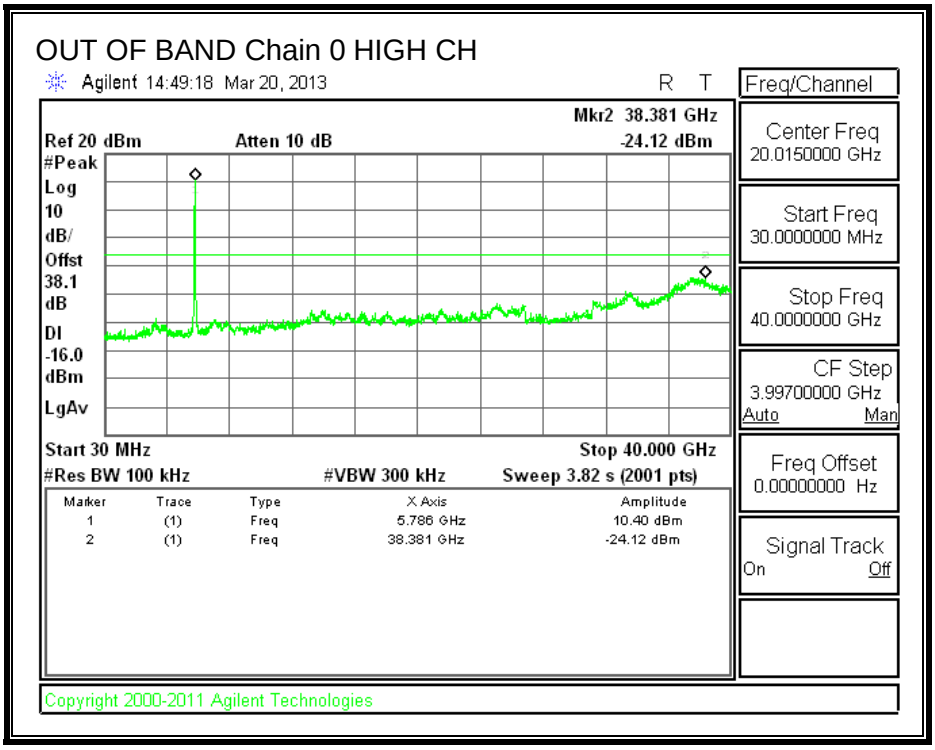


HIGH CHANNEL BANDEDGE, Chain 0

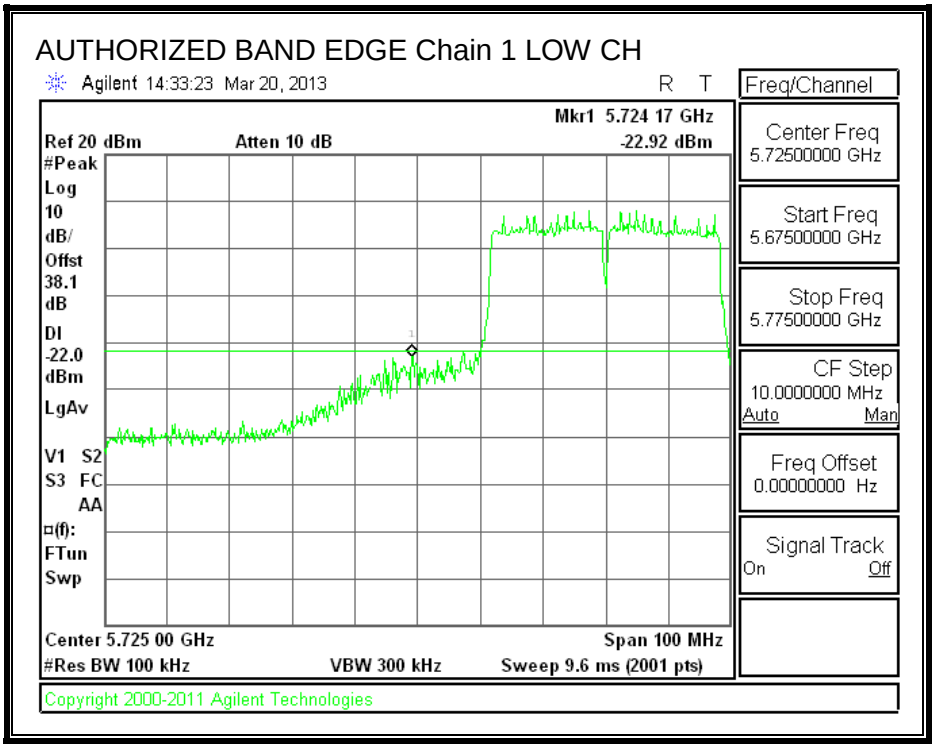


OUT-OF-BAND EMISSIONS, Chain 0

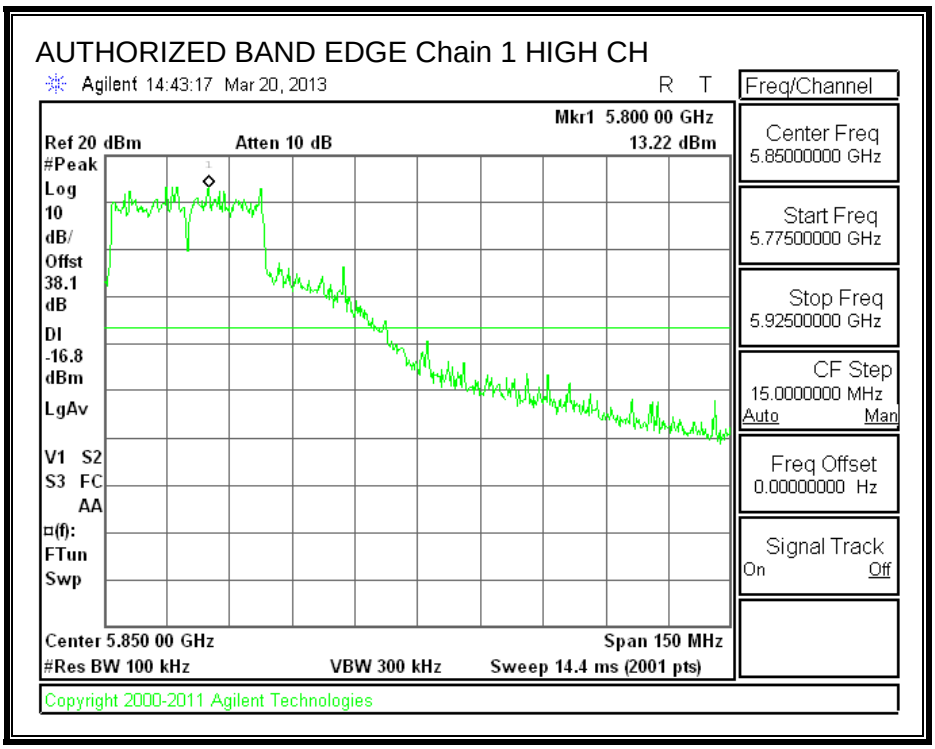




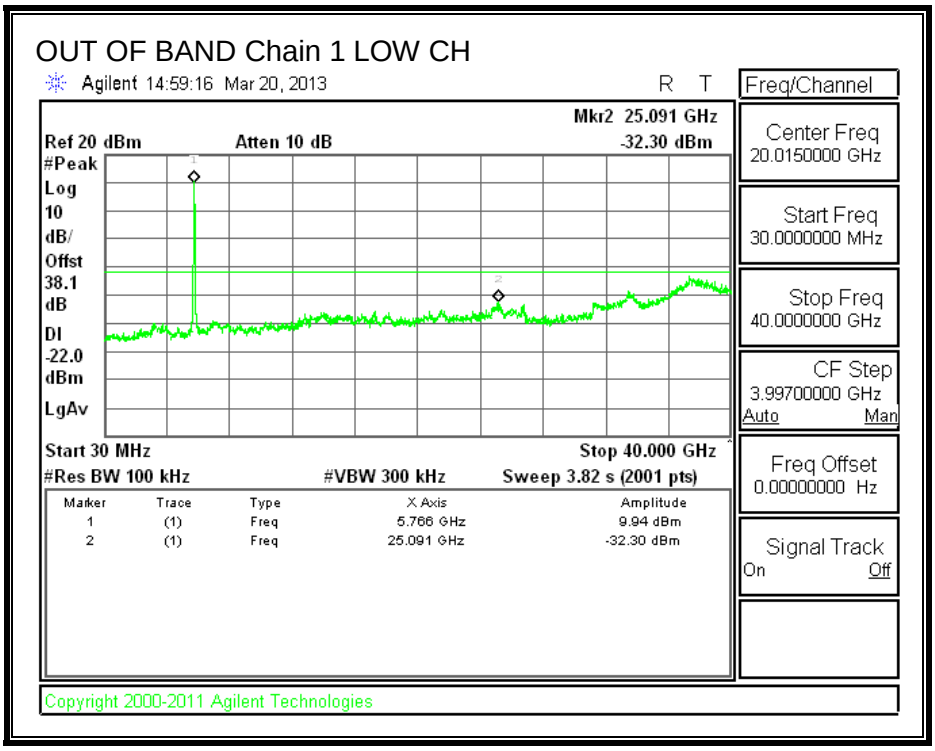
LOW CHANNEL BANDEDGE, Chain 1

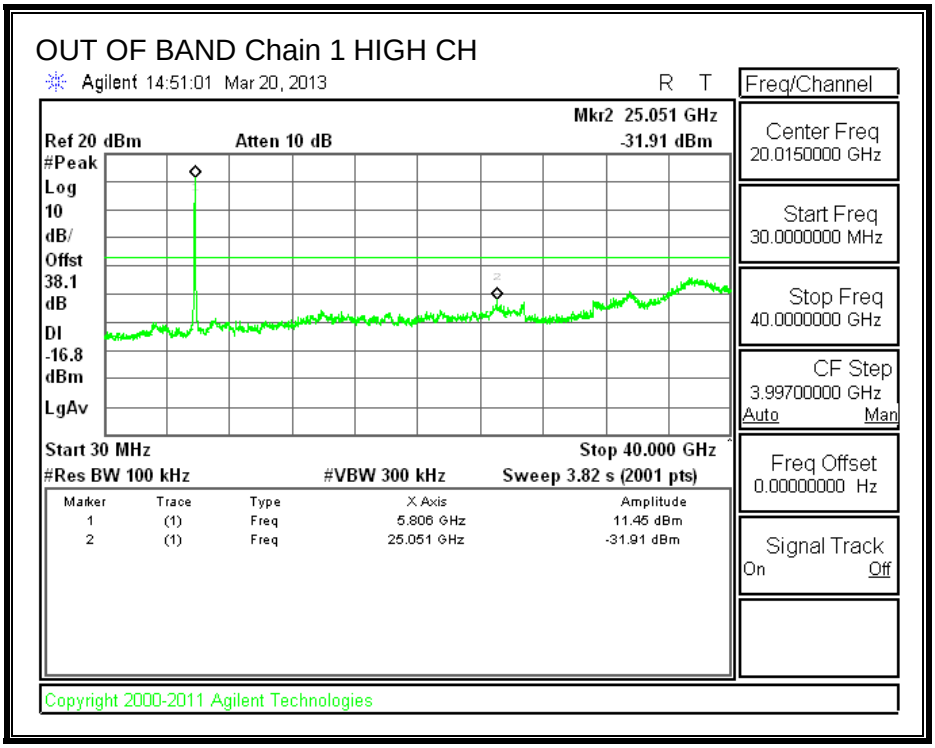


HIGH CHANNEL BANDEDGE, Chain 1

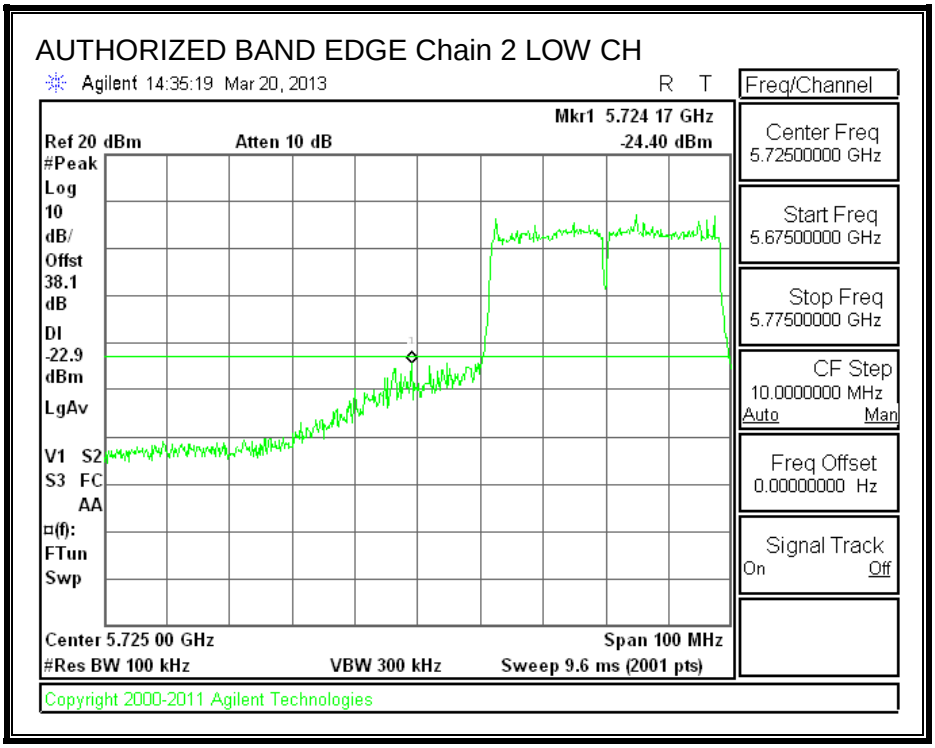


OUT-OF-BAND EMISSIONS, Chain 1

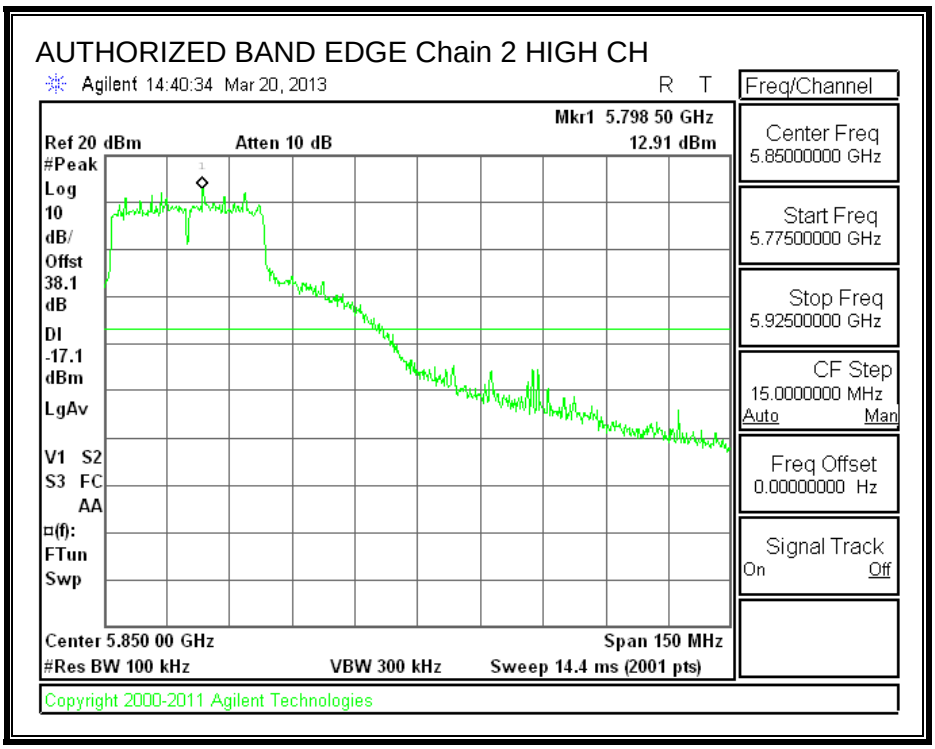




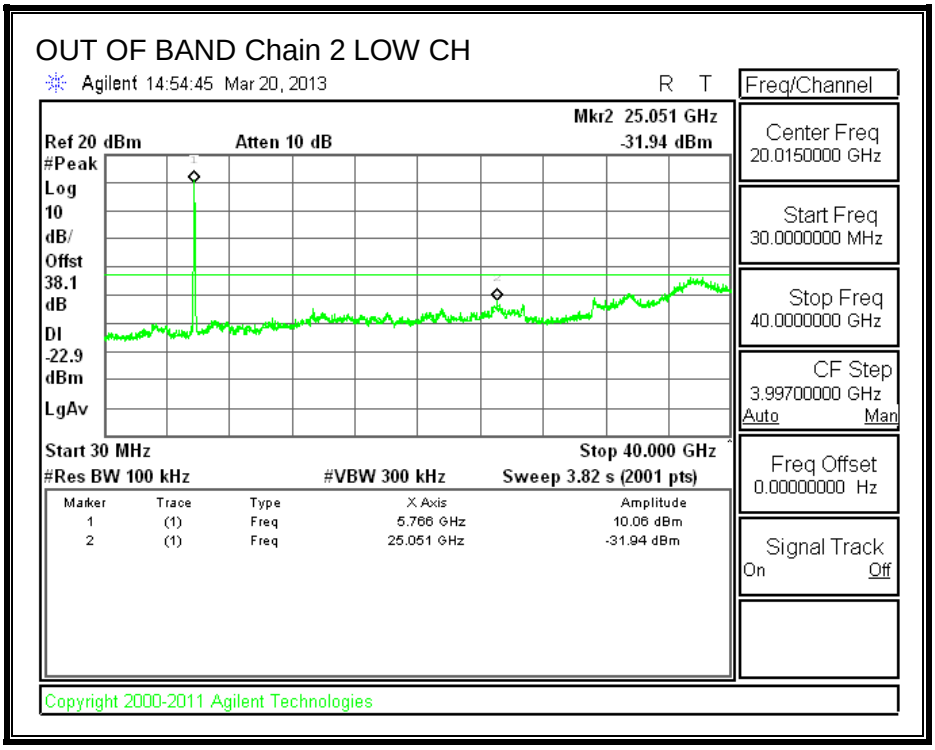
LOW CHANNEL BANDEDGE, Chain 2

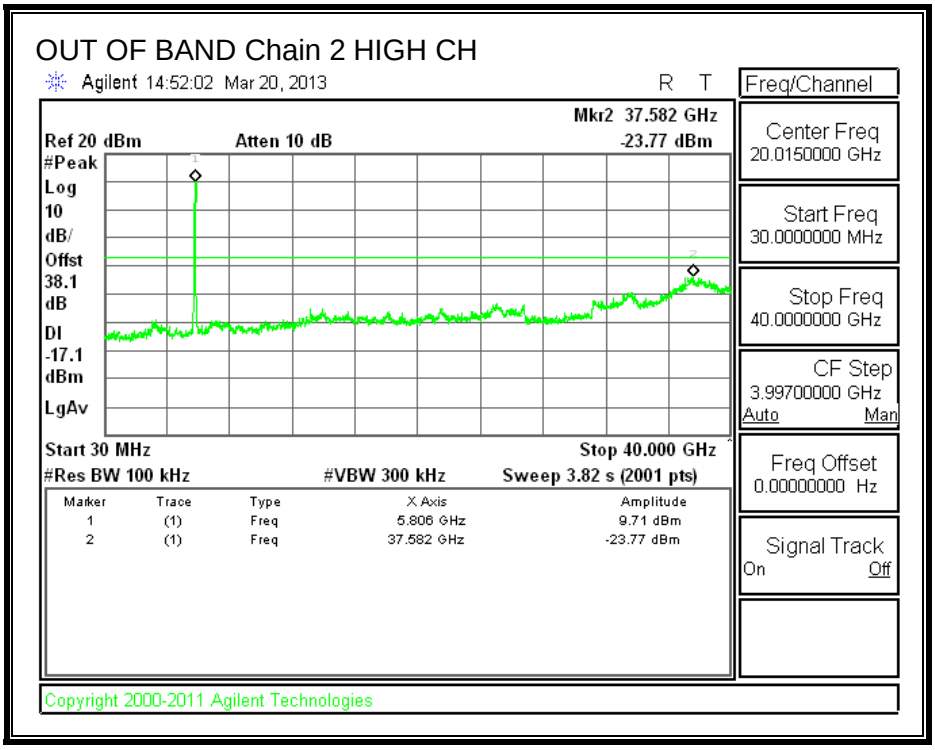


HIGH CHANNEL BANDEDGE, Chain 2



OUT-OF-BAND EMISSIONS, Chain 2





8.21. 802.11ac VHT80 1TX MODE IN THE 5.8 GHz BAND

Covered by testing 802.11n AC80 CDD 3TX, power per chain used in the 802.11n AC80 CDD 3TX mode is equal to the power per chain that will be used for 802.11n AC80 1TX mode.

8.22. 802.11ac VHT80 CDD 2TX MODE IN THE 5.8 GHz BAND

Covered by testing 802.11n AC80 CDD 3TX, power per chain used in the 802.11n AC80 CDD 3TX mode is equal to the power per chain that will be used for 802.11n AC80 CDD 2TX mode.

8.23. 802.11ac VHT80 BF 2TX MODE IN THE 5.8 GHz BAND

Covered by testing 802.11n AC80 CDD 3TX, power per chain used in the 802.11n AC80 CDD 3TX mode is equal to the power per chain that will be used for 802.11n AC80 BF 2TX mode.

8.23.1. OUTPUT AVERAGE POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

Use this table for uncorrelated chains and unequal antenna gain

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
2.70	1.90	4.40	7.83

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Mid	5755	7.83	28.17	30	36	28.17

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Mid	5755	21.00	21.30	21.10	25.91	28.17	-2.26

8.24. 802.11ac VHT80 BF 3TX MODE IN THE 5.8 GHz BAND

Covered by testing 802.11n AC80 CDD 3TX, power per chain used in the 802.11n AC80 CDD 3TX mode is equal to the power per chain that will be used for 802.11n AC80 BF 3TX mode.

8.24.1. OUTPUT AVERAGE POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

Use this table for uncorrelated chains and unequal antenna gain

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
2.70	1.90	4.40	7.83

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Mid	5755	7.83	28.17	30	36	28.17

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Mid	5755	21.00	21.30	21.10	25.91	28.17	-2.26

8.25. 802.11ac VHT80 CDD 3TX MODE IN THE 5.8 GHz BAND (CH155)

8.25.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

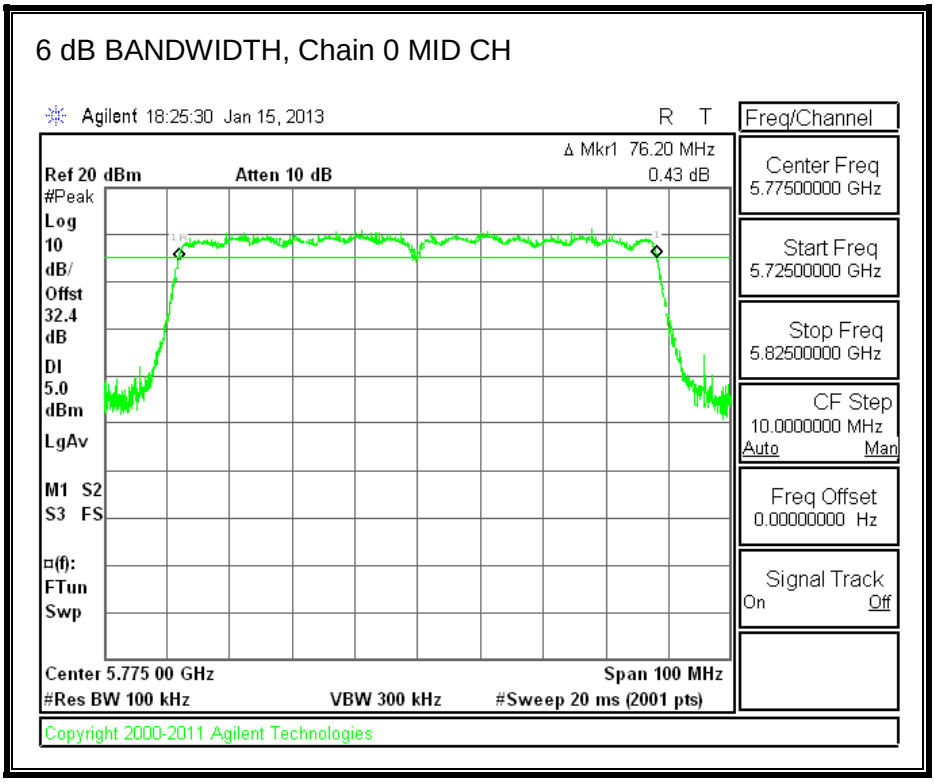
IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

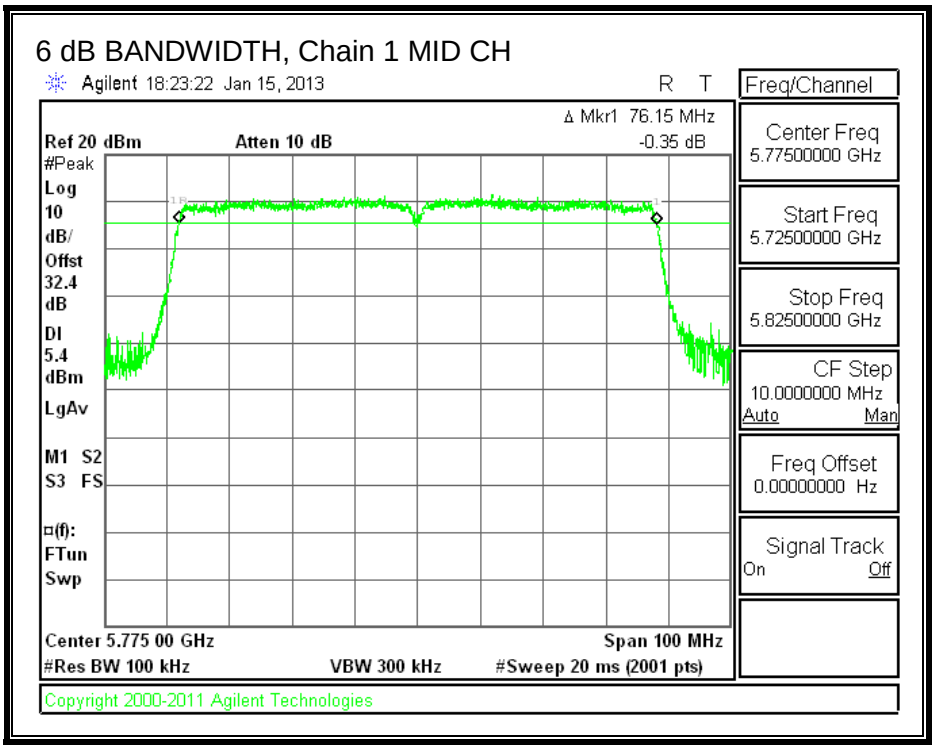
RESULTS

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	6 dB BW Chain 2 (MHz)	Minimum Limit (MHz)
Mid	5775	76.20	76.15	76.05	0.5

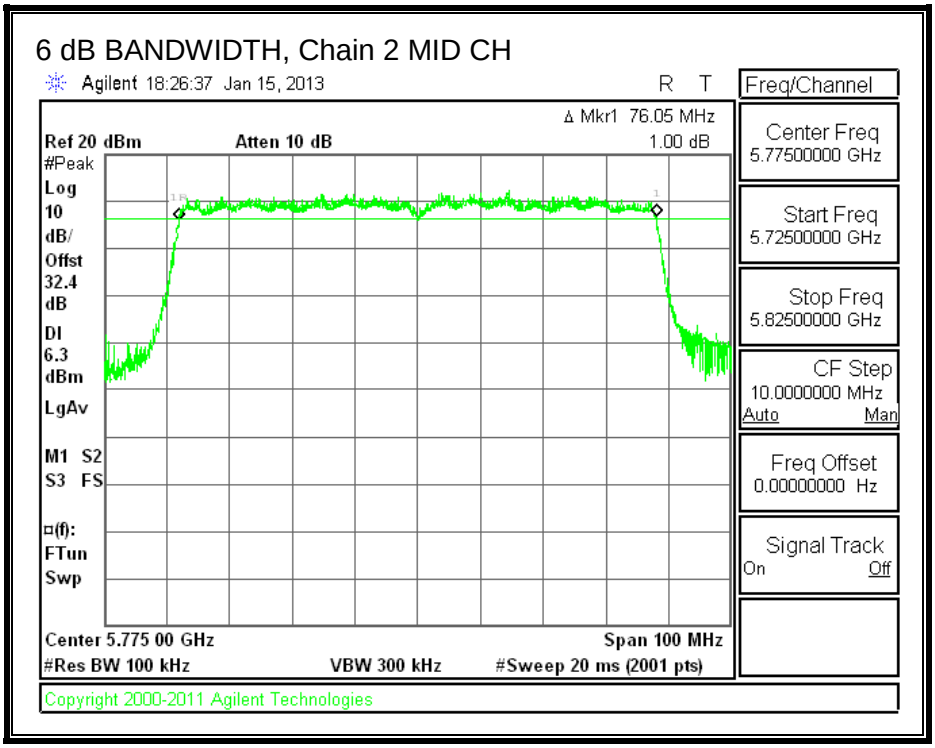
6 dB BANDWIDTH, Chain 0



6 dB BANDWIDTH, Chain 1



6 dB BANDWIDTH, Chain 2



8.25.2. 99% BANDWIDTH

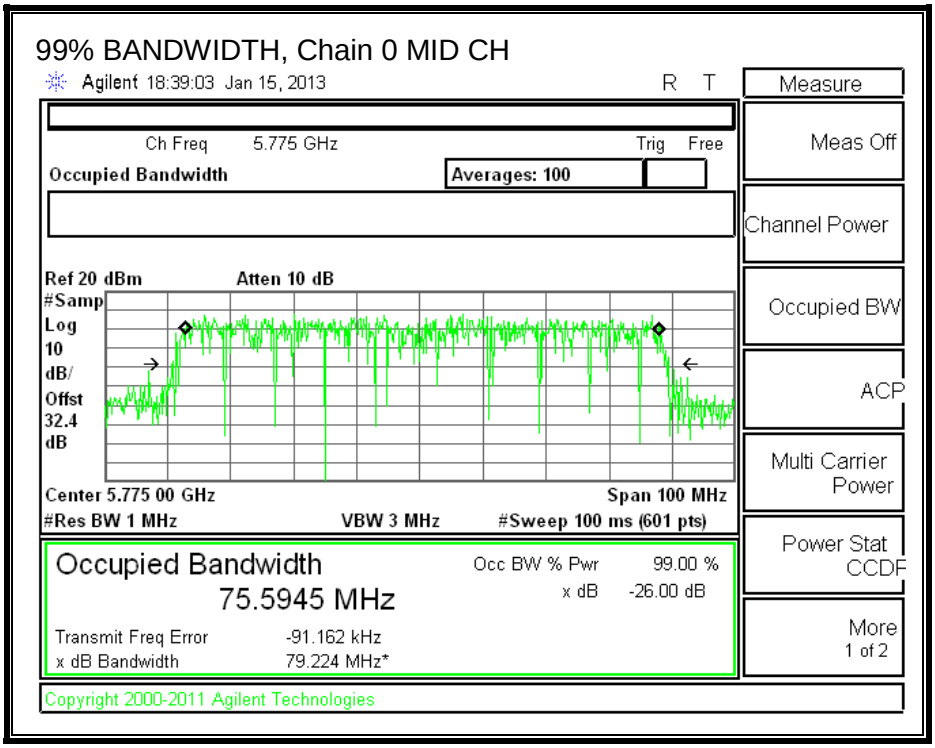
LIMITS

None; for reporting purposes only.

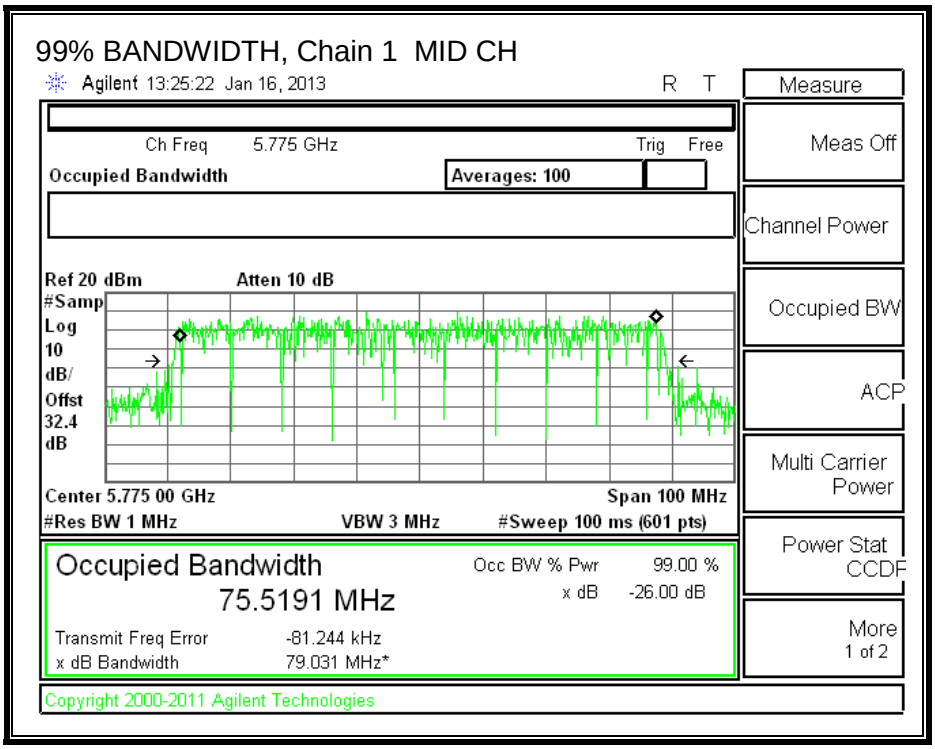
RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
MID	5775	75.5945	75.5191	75.6038

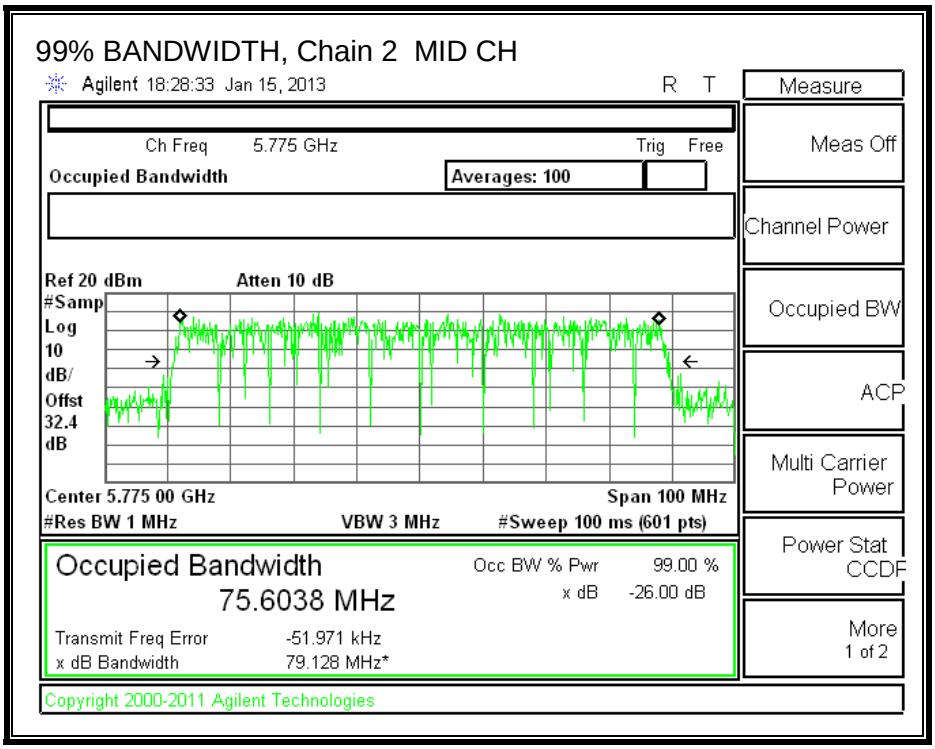
99% BANDWIDTH, Chain 0



99% BANDWIDTH, Chain 1



99% BANDWIDTH, Chain 2



8.25.3. OUTPUT AVERAGE POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

Use this table for uncorrelated chains and unequal antenna gain

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
2.70	1.90	4.40	3.13

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Mid	5755	3.13	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Mid	5755	21.00	21.30	21.10	25.91	30.00	-4.09

8.25.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247

IC RSS-210 A8.2

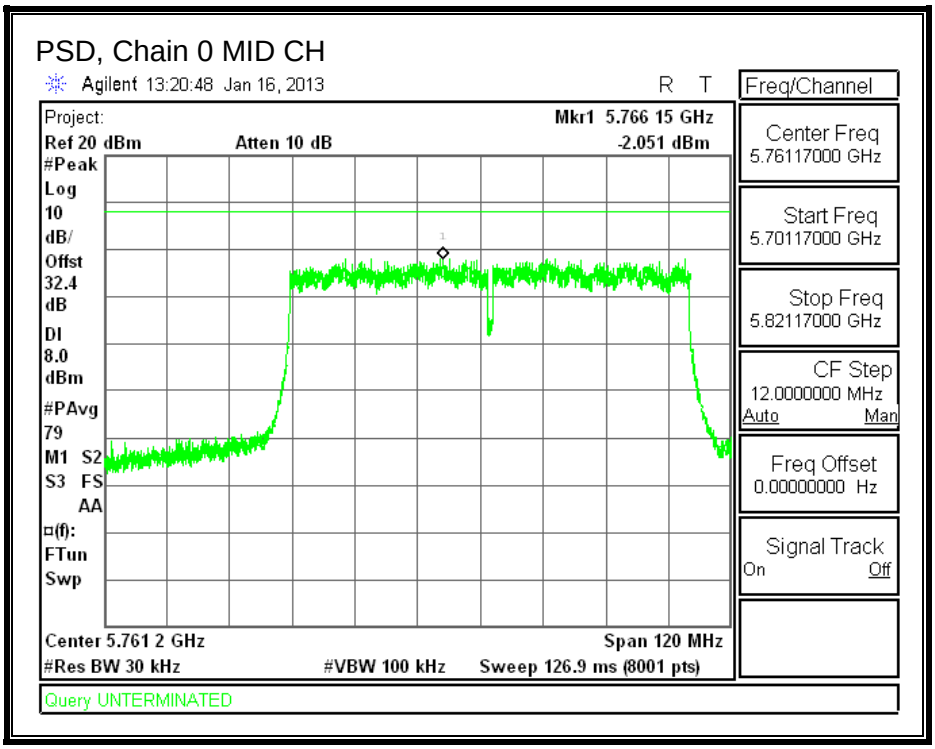
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

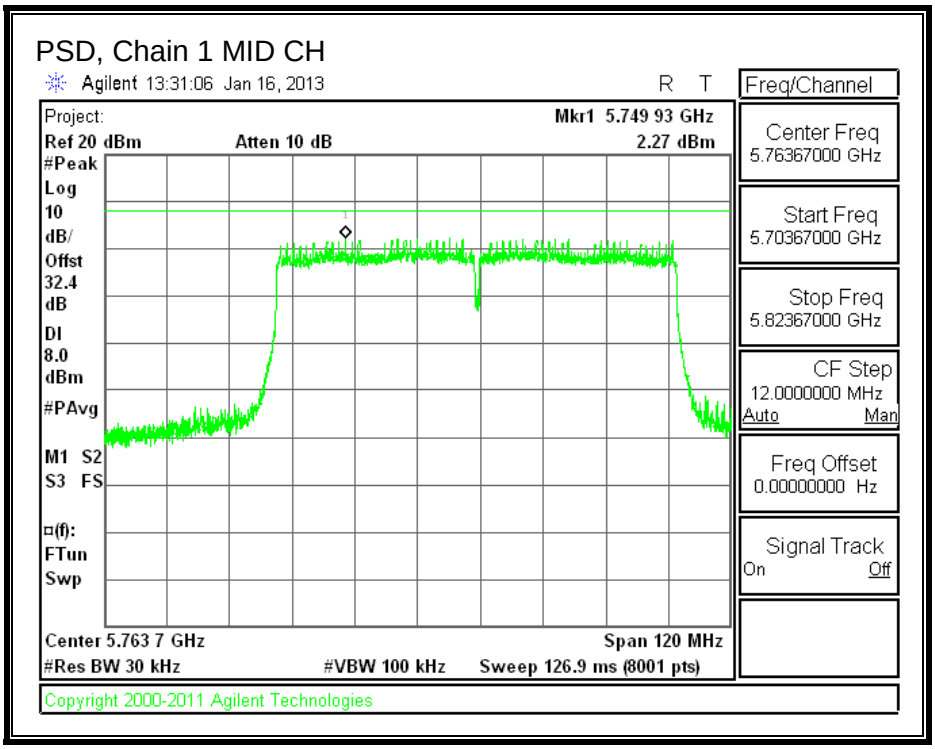
PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Chain 2 Meas (dBm)	DCCF (dB)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Mid	5755	-2.051	2.270	-2.000	0.09	4.78	8.0	-3.2

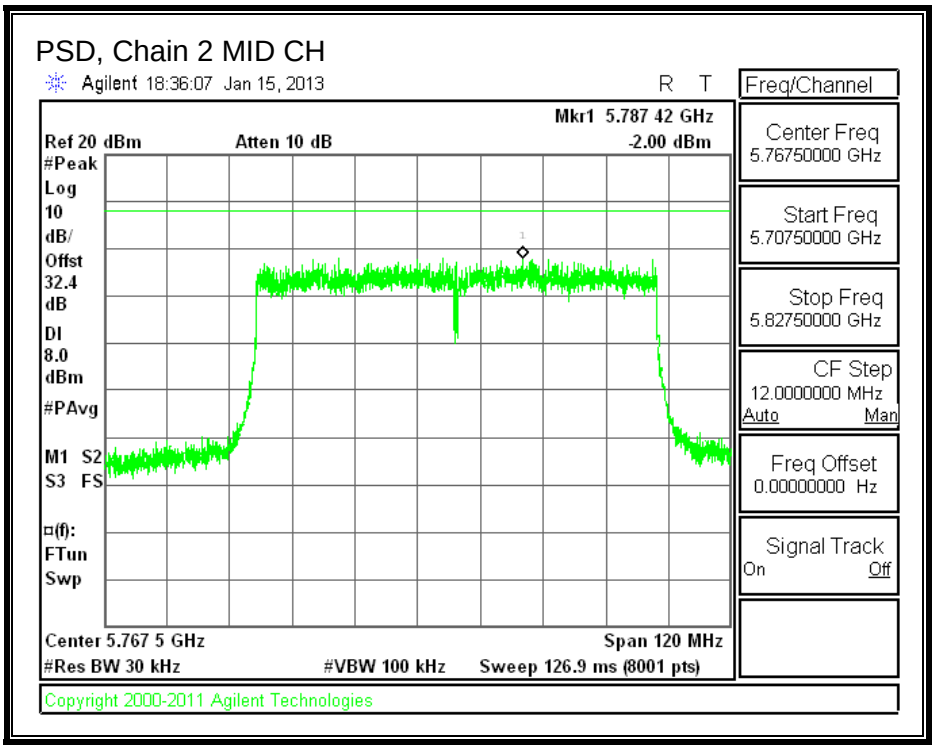
PSD, Chain 0



PSD, Chain 1



PSD, Chain 2



8.25.5. OUT-OF-BAND EMISSIONS

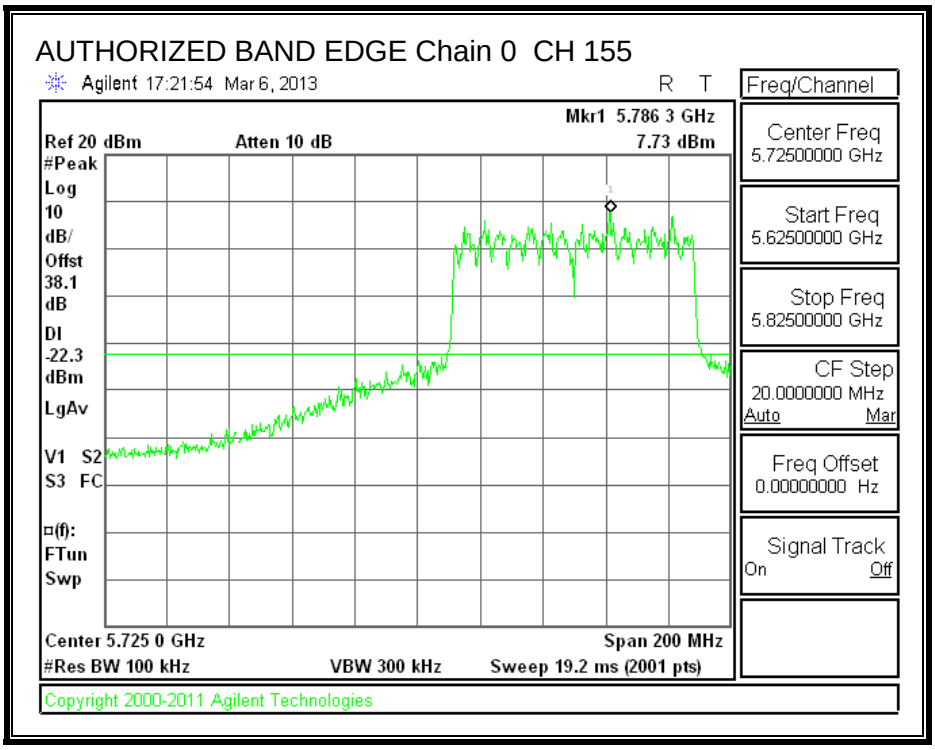
LIMITS

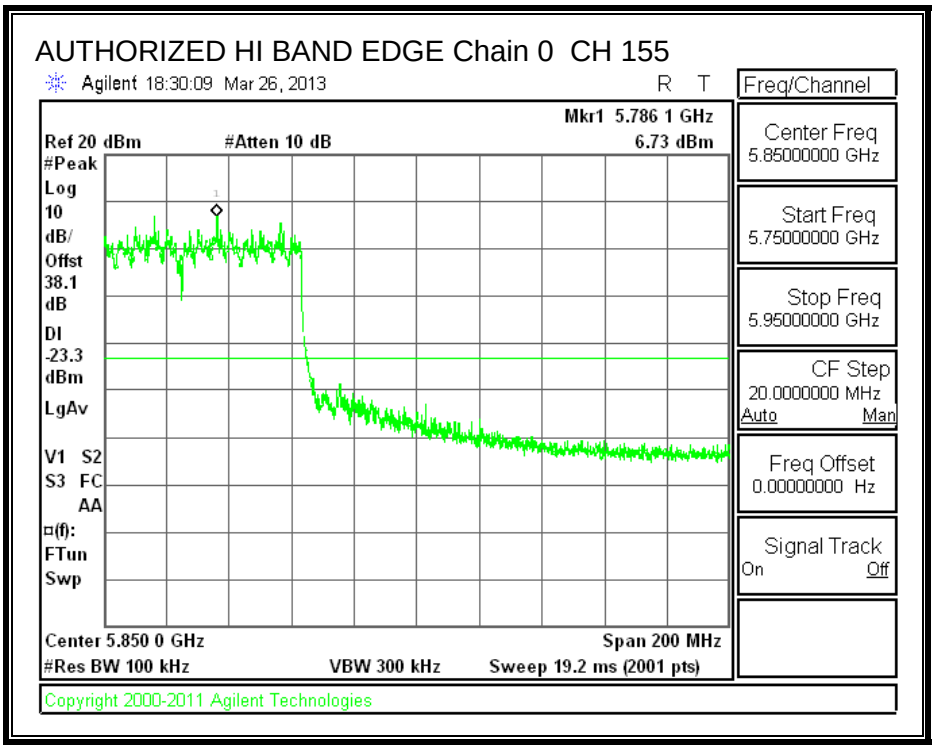
FCC §15.247 (d)

IC RSS-210 A8.5

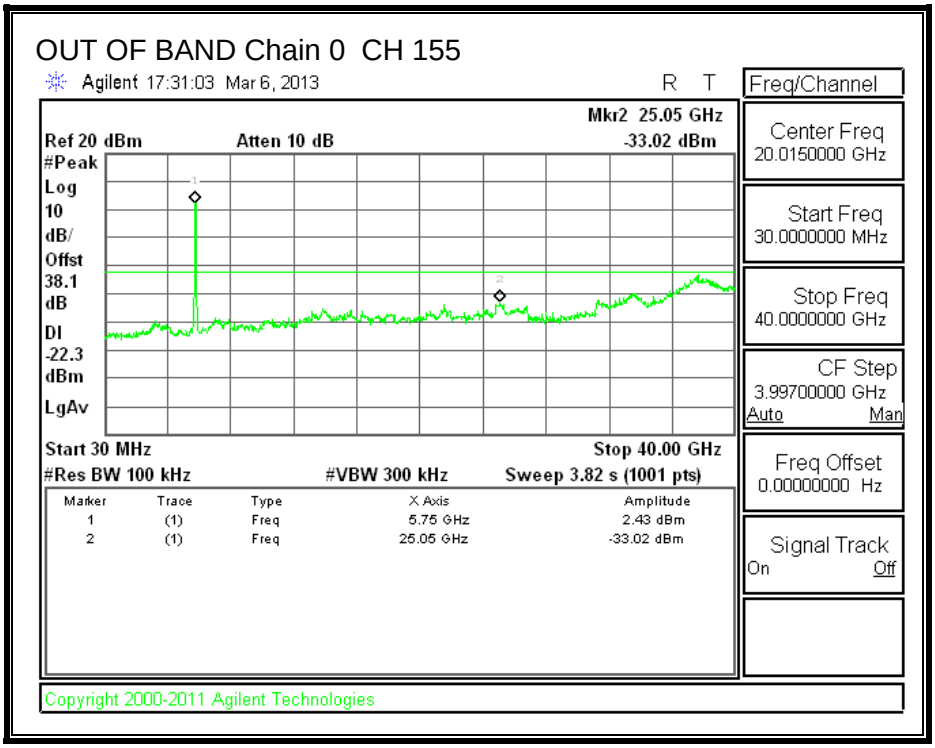
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

BANDEDGE, Chain 0

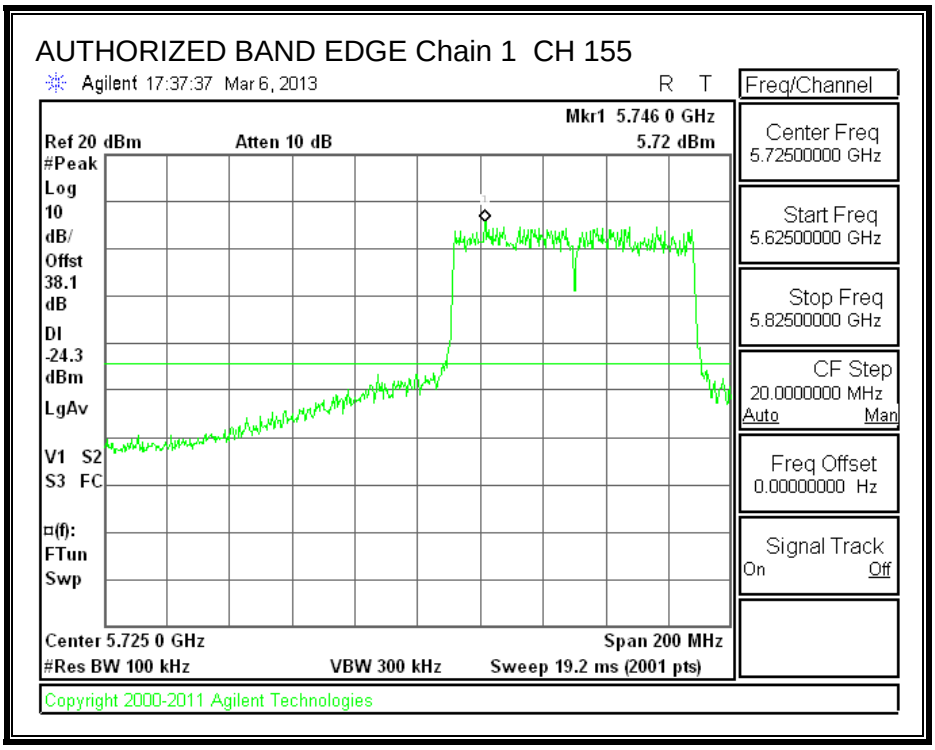


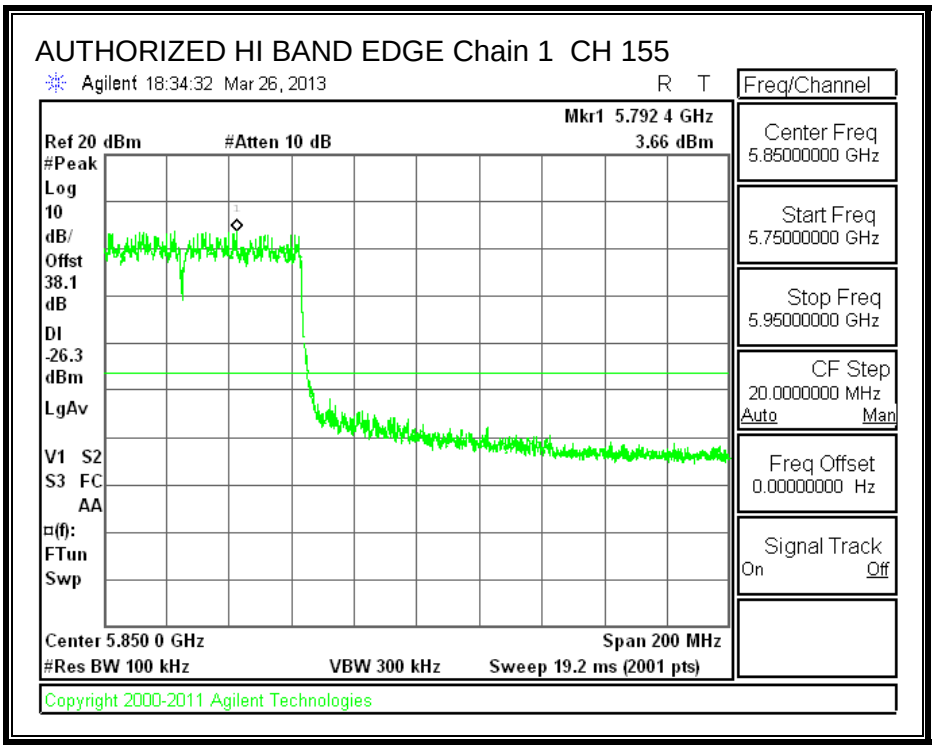


OUT-OF-BAND EMISSIONS, Chain 0

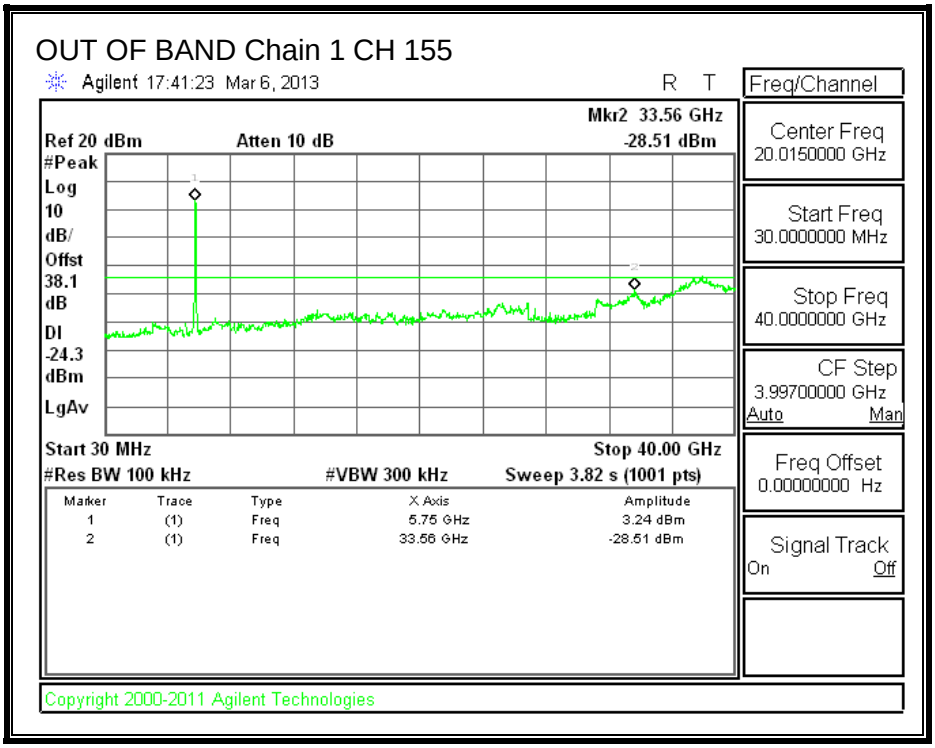


LOW CHANNEL BANDEDGE, Chain 1

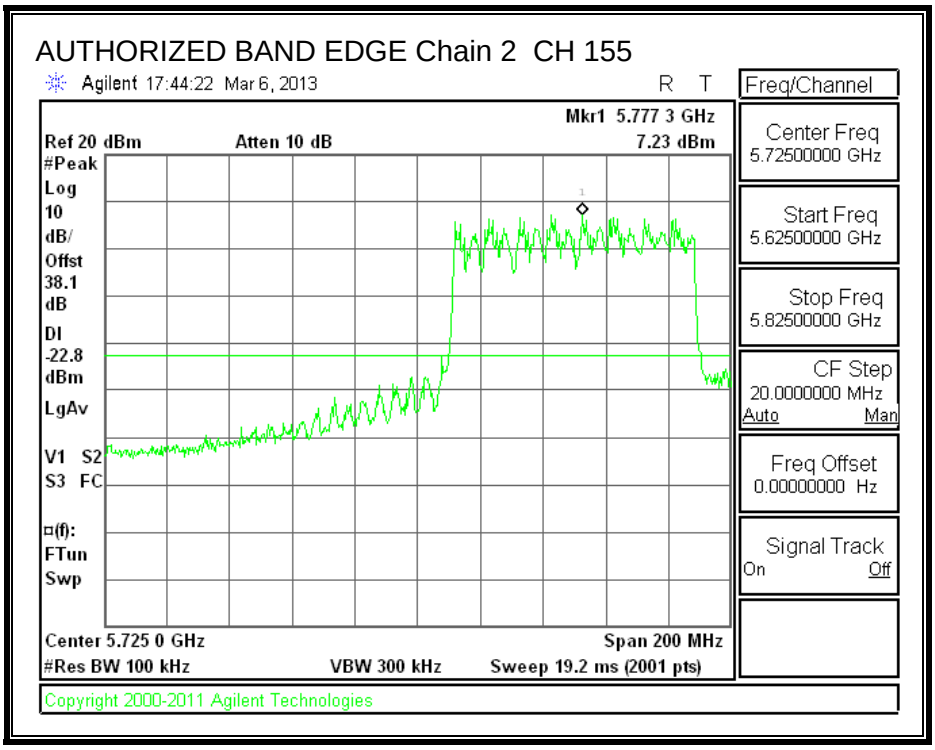


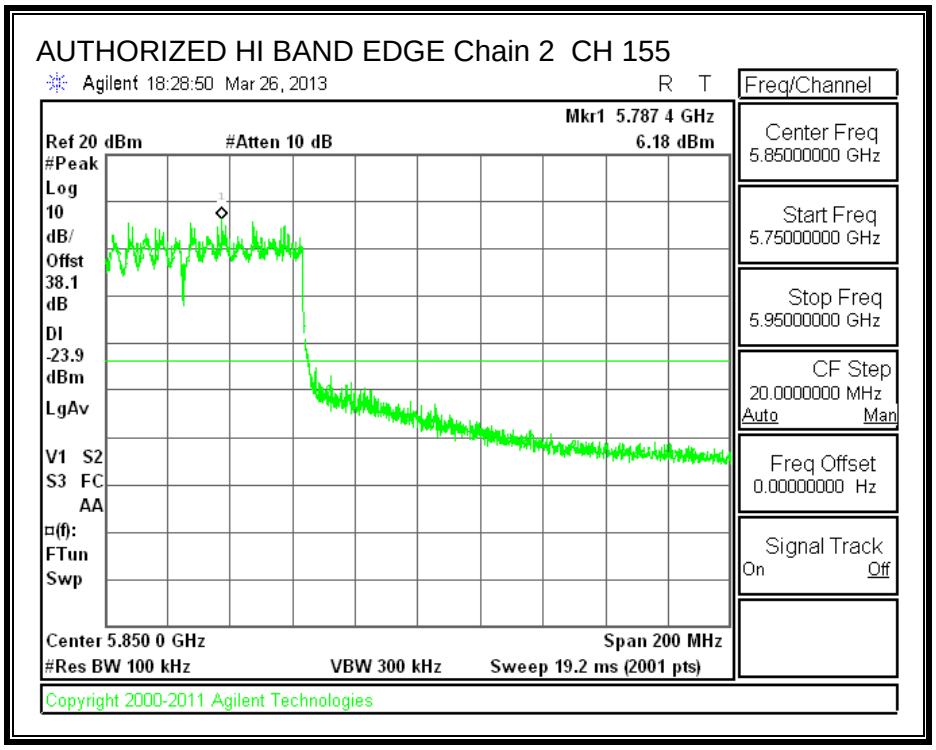


OUT-OF-BAND EMISSIONS, Chain 1

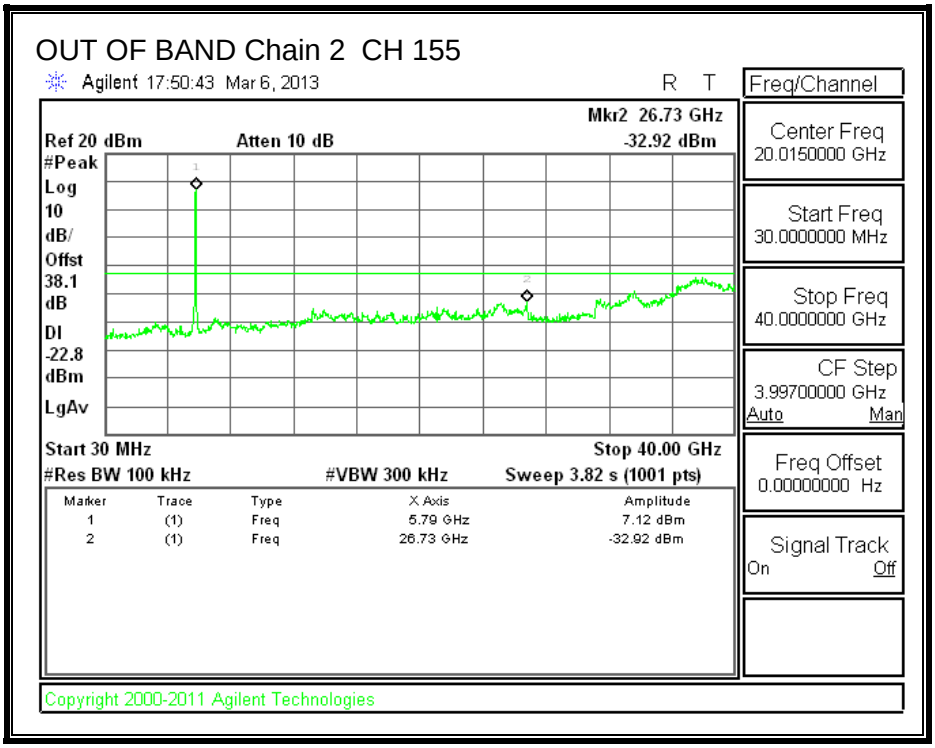


LOW CHANNEL BANDEDGE, Chain 2





OUT-OF-BAND EMISSIONS, Chain 2



8.26. 802.11n HT20 BF 2TX MODE IN THE 5.8 GHz BAND

Covered by testing HT20 CDD MCS0 3TX, total power across all three chains is higher than the power level the device will operate at.

However, output average power is provided below for this mode.

8.26.1. OUTPUT AVERAGE POWER

DIRECTIONAL ANTENNA GAIN

The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
2.70	4.40	6.60

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	5745	6.60	29.40	30	36	29.40
Mid	5785	6.60	29.40	30	36	29.40
High	5825	6.60	29.40	30	36	29.40

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margi (dB)
Low	5745	22.00	22.30	25.16	29.40	-4.24
Mid	5785	24.80	25.20	28.01	29.40	-1.39
High	5825	23.90	24.00	26.96	29.40	-2.44

8.27. 802.11n HT20 BF 3TX MODE IN THE 5.8 GHz BAND

Covered by testing HT20 CDD MCS0 3TX, total power across all three chains is higher than the power level the device will operate at.

However, output average power is provided below for this mode.

8.27.1. OUTPUT AVERAGE POWER

DIRECTIONAL ANTENNA GAIN

The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
2.70	1.90	4.40	7.83

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	5745	7.83	28.17	30	36	28.17
Mid	5785	7.83	28.17	30	36	28.17
High	5825	7.83	28.17	30	36	28.17

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	5745	22.10	22.60	22.25	27.09	28.17	-1.08
Mid	5785	22.15	22.70	22.30	27.16	28.17	-1.01
High	5825	22.10	22.65	22.25	27.11	28.17	-1.06

8.28. 802.11n HT40 BF 2TX MODE IN THE 5.8 GHz BAND

Covered by testing HT40 CDD MCS0 3TX, total power across all three chains is higher than the power level the device will operate at.

However, output average power is provided below for this mode.

8.28.1. OUTPUT AVERAGE POWER

DIRECTIONAL ANTENNA GAIN

The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
2.70	4.40	6.60

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	5745	6.60	29.40	30	36	29.40
High	5825	6.60	29.40	30	36	29.40

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margi (dB)
Low	5755	20.50	20.75	23.64	29.40	-5.76
High	5795	24.30	24.60	27.46	29.40	-1.94

8.29. 802.11n HT40 BF 3TX MODE IN THE 5.8 GHz BAND

Covered by testing HT40 CDD MCS0 3TX, total power across all three chains is higher than the power level the device will operate at.

However, output average power is provided below for this mode.

8.29.1. OUTPUT AVERAGE POWER

DIRECTIONAL ANTENNA GAIN

The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
2.70	1.90	4.40	7.83

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	5745	7.83	28.17	30	36	28.17
High	5825	7.83	28.17	30	36	28.17

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	5755	20.50	20.70	20.65	25.39	28.17	-2.78
High	5795	22.10	22.50	22.30	27.07	28.17	-1.10

9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

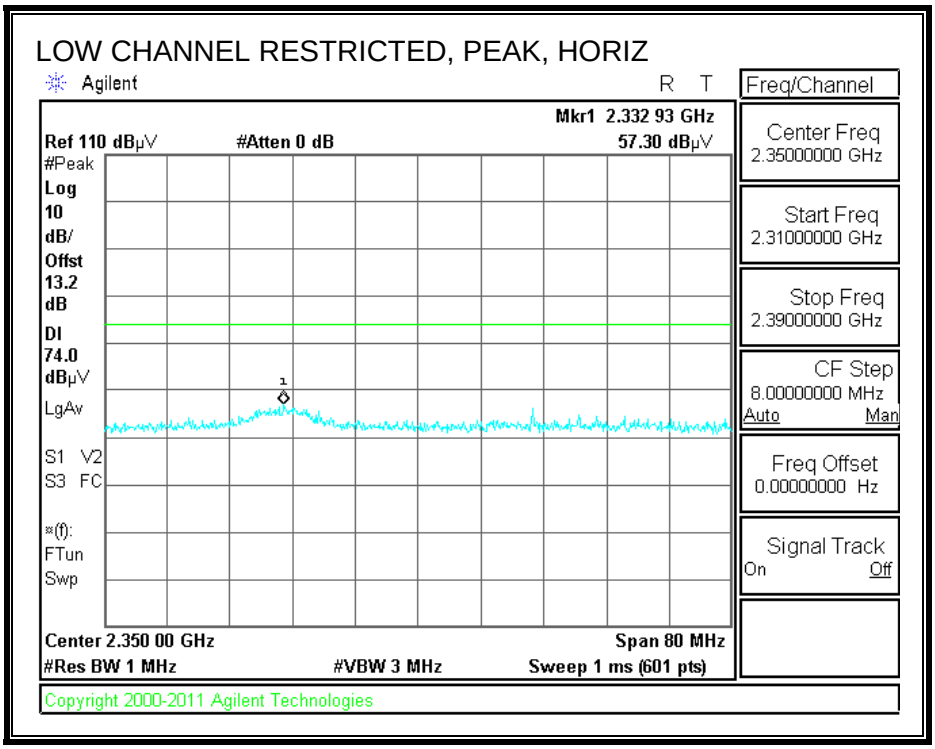
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements.

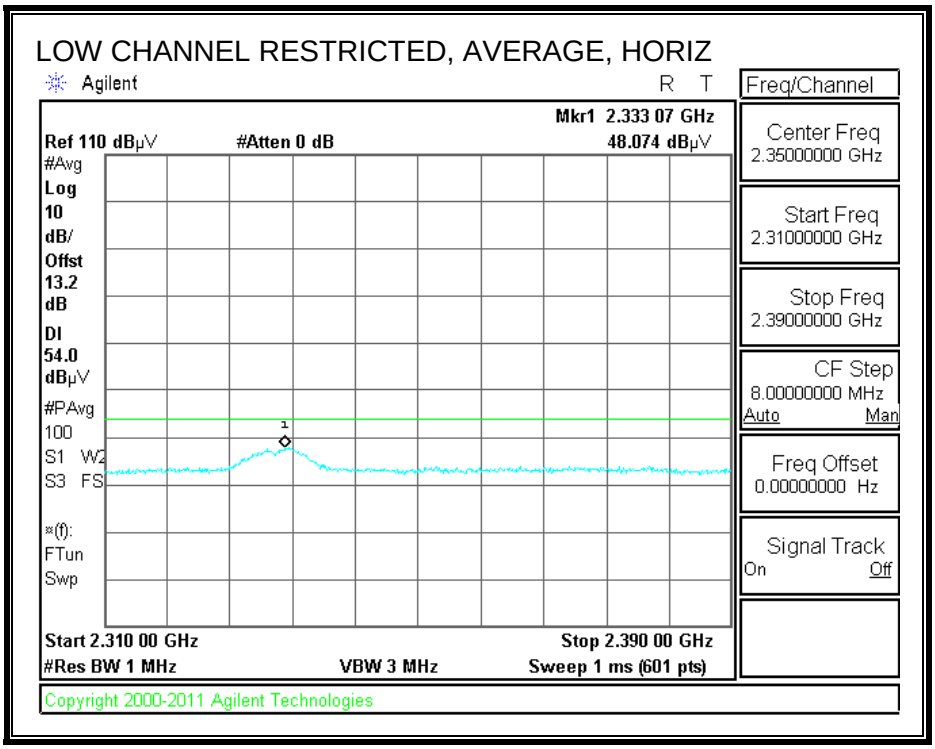
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

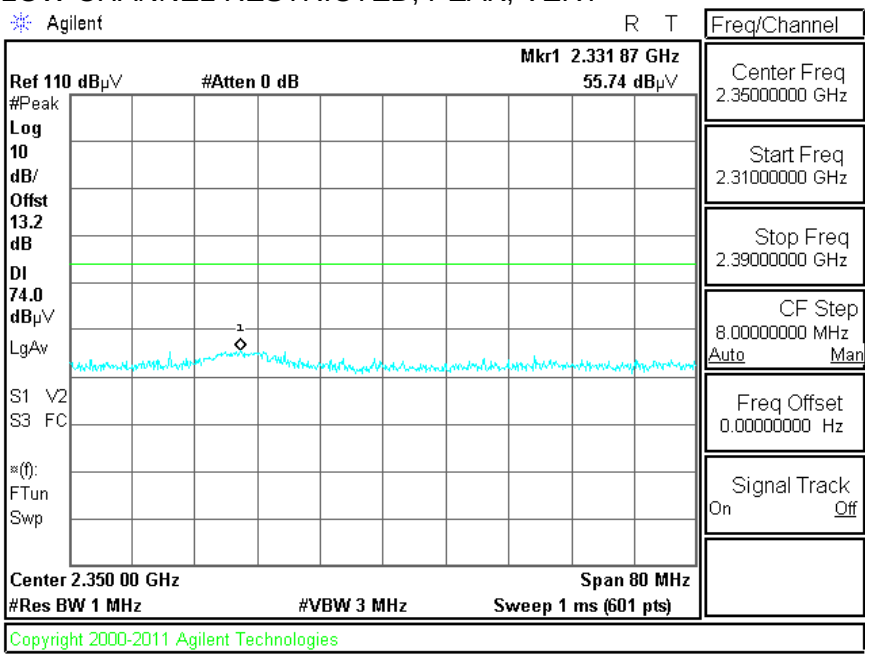
9.2. TX ABOVE 1 GHz 802.11b 1TX MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL) CH1

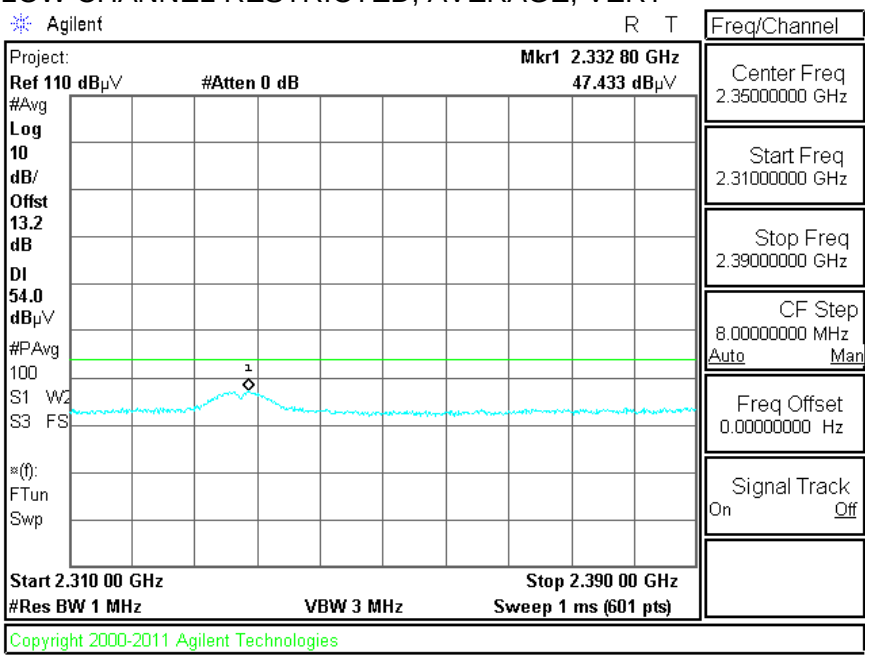




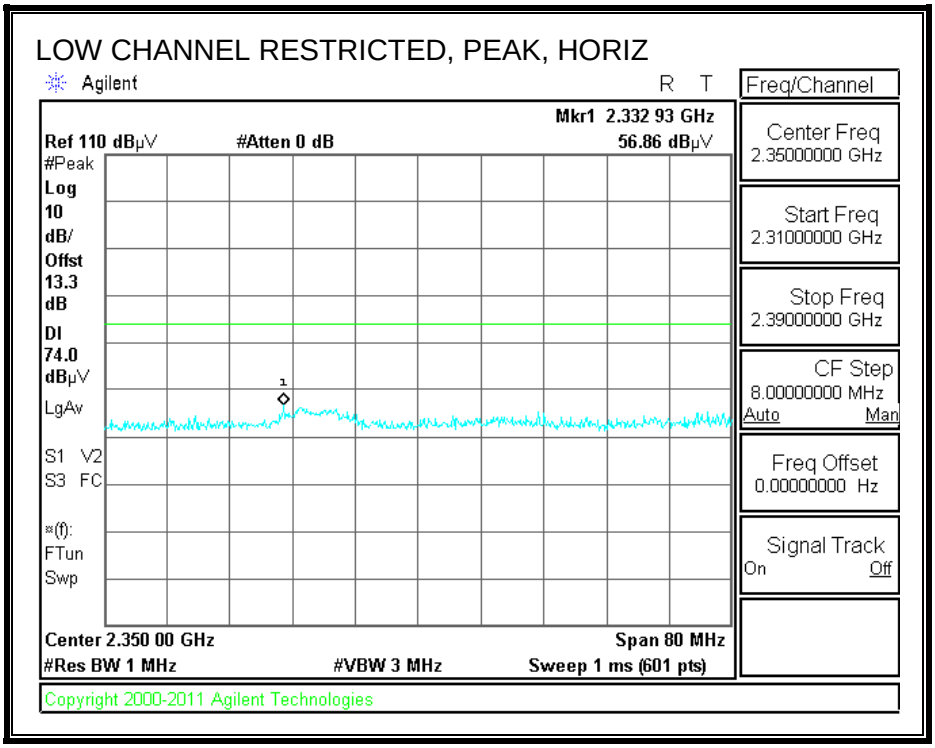
LOW CHANNEL RESTRICTED, PEAK, VERT

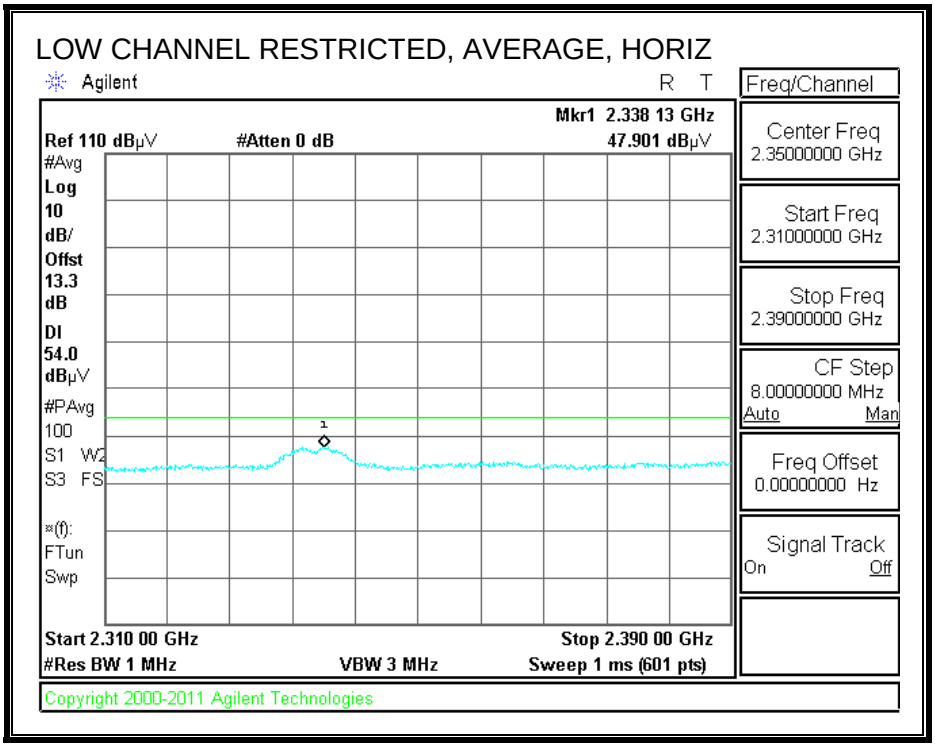


LOW CHANNEL RESTRICTED, AVERAGE, VERT

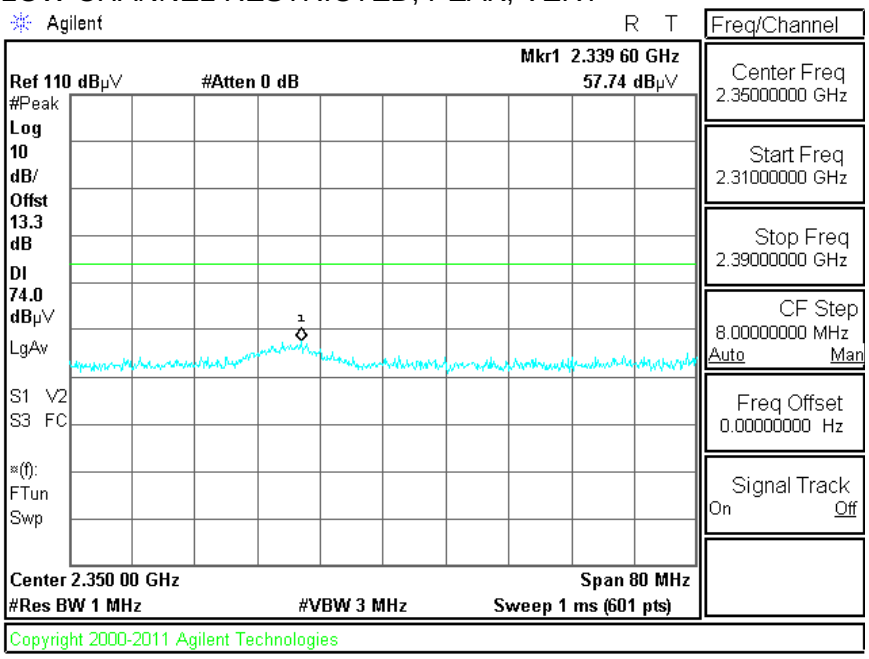


RESTRICTED BANDEDGE (LOW CHANNEL) CH2

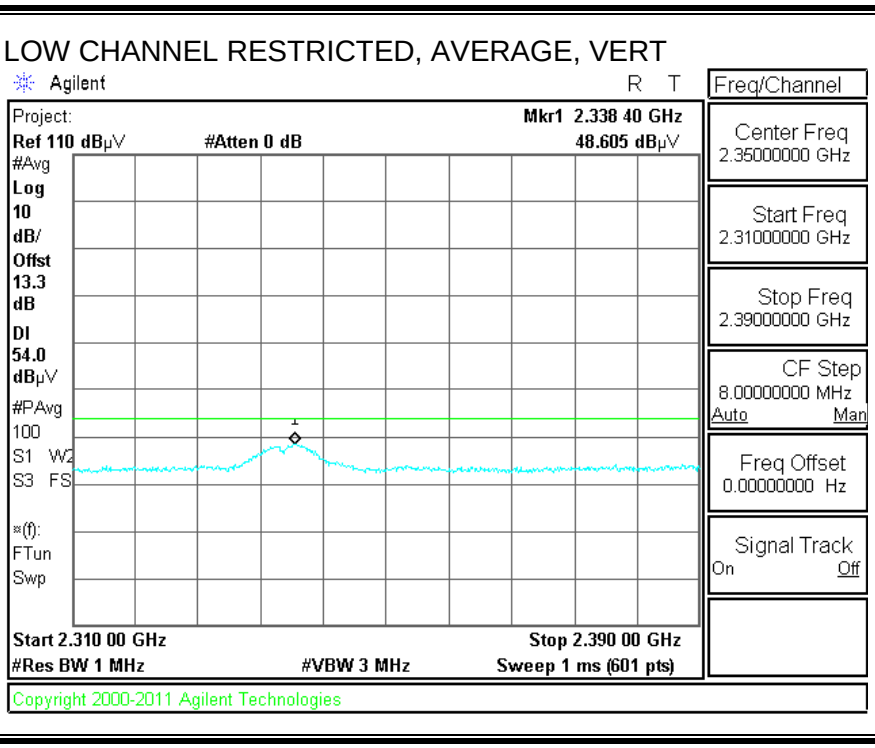




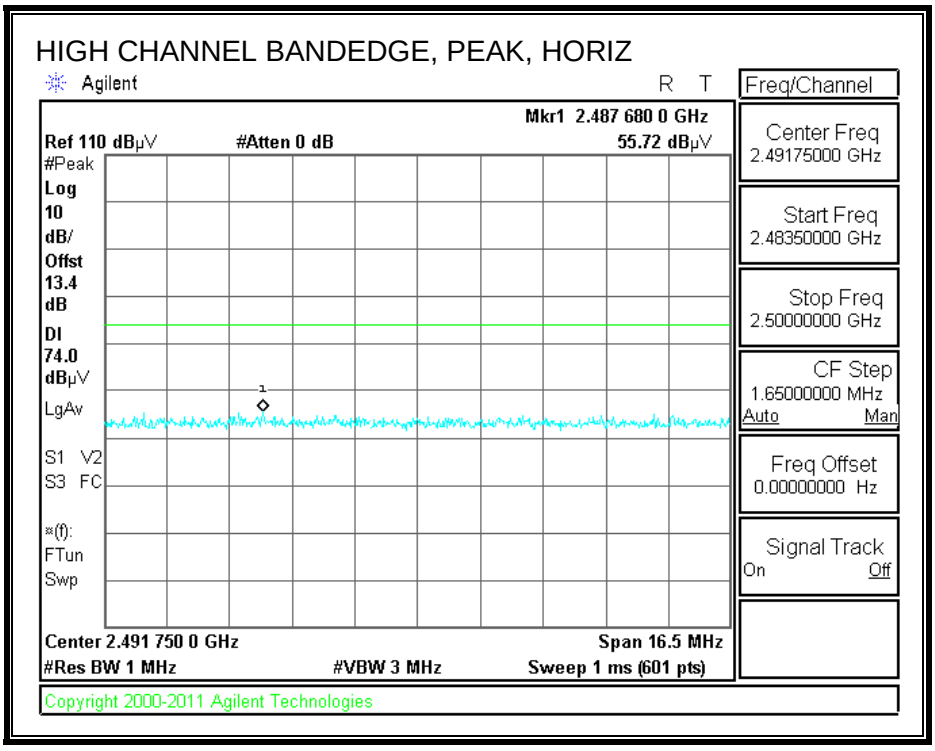
LOW CHANNEL RESTRICTED, PEAK, VERT

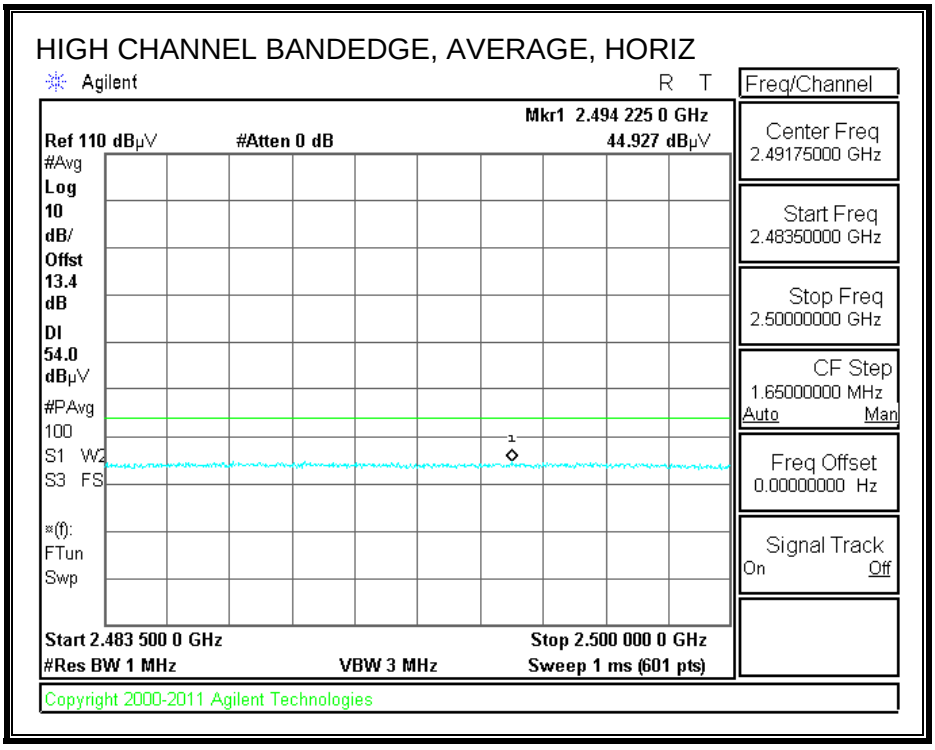


LOW CHANNEL RESTRICTED, AVERAGE, VERT

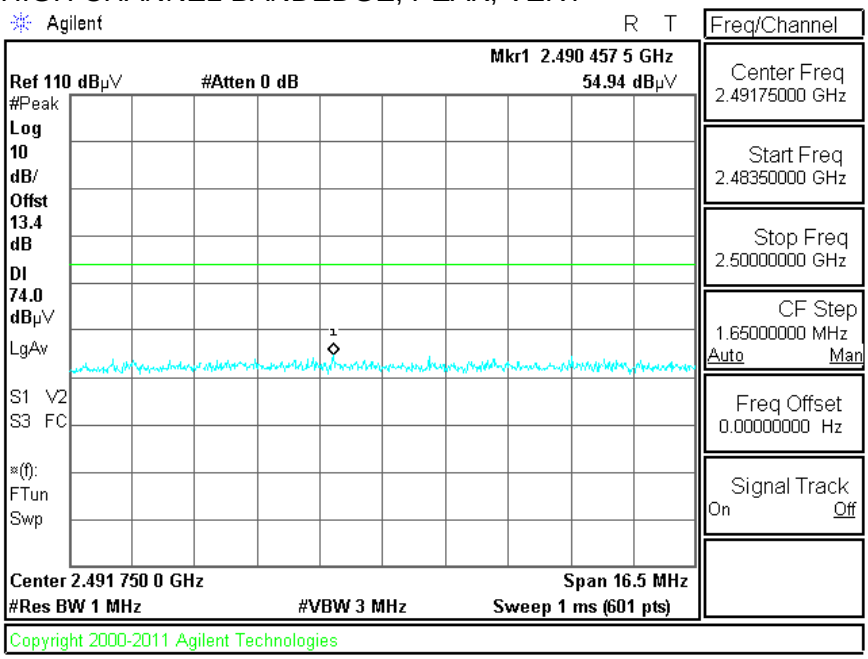


AUTHORIZED BANDEDGE (HIGH CHANNEL) CH10

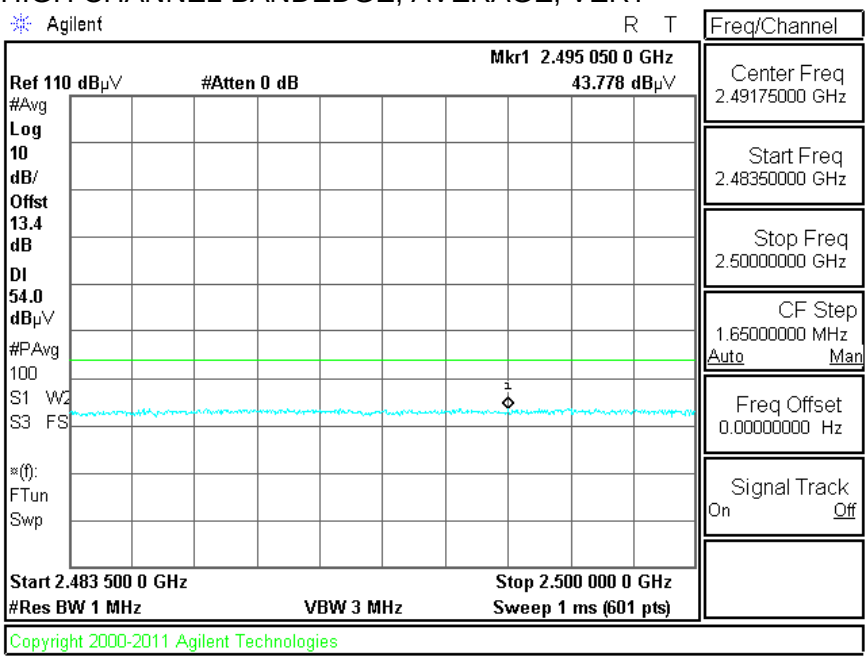




HIGH CHANNEL BANDEDGE, PEAK, VERT

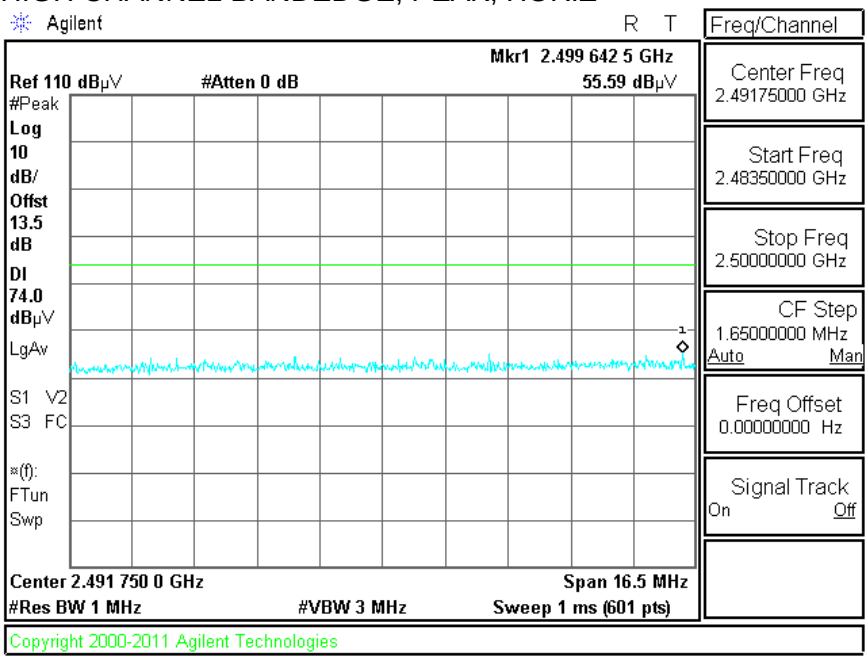


HIGH CHANNEL BANDEDGE, AVERAGE, VERT

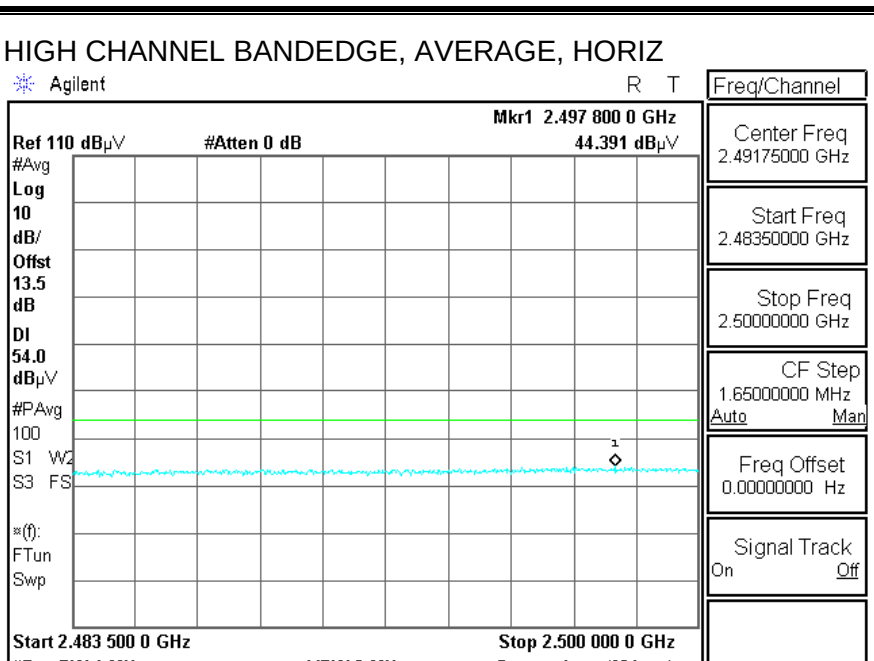


AUTHORIZED BANDEDGE (HIGH CHANNEL) CH11

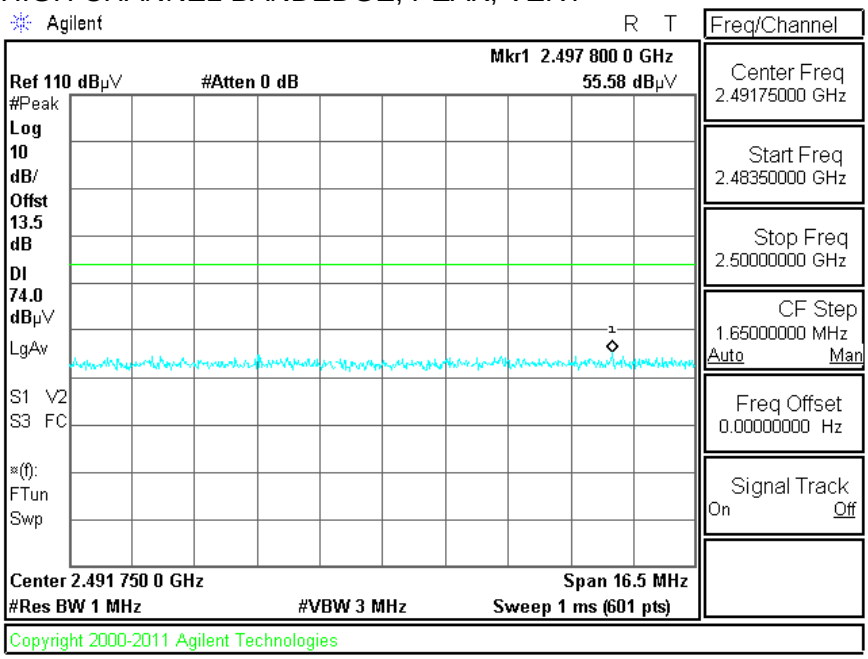
HIGH CHANNEL BANDEDGE, PEAK, HORIZ



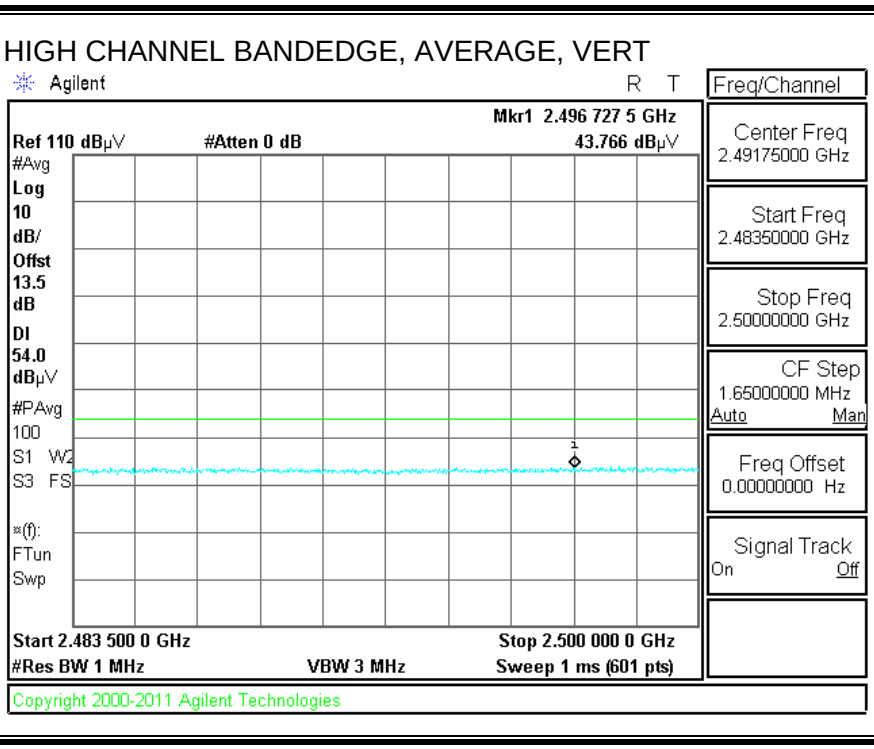
HIGH CHANNEL BANDEDGE, AVERAGE, HORIZ



HIGH CHANNEL BANDEDGE, PEAK, VERT



HIGH CHANNEL BANDEDGE, AVERAGE, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Oliver Su
Date: 02/18/13
Project #: 12U14745
Company: Apple
Test Target:
Mode Oper: 11b 3Tx Power= 24 dBm per Chain

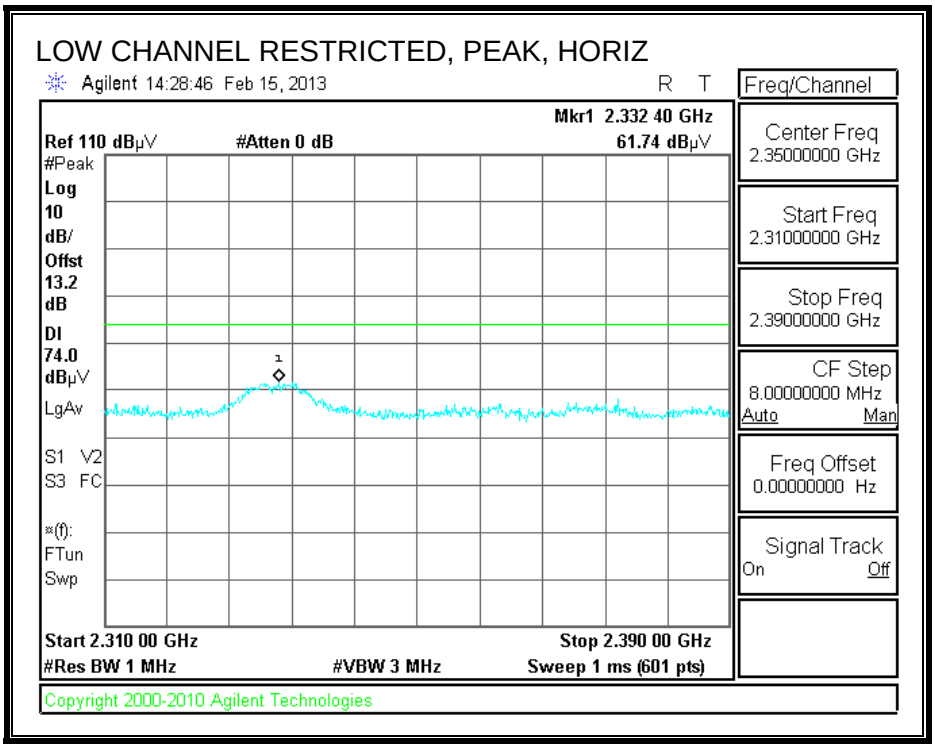
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch_2412MHz													
4.824	3.0	39.6	33.1	6.8	-34.1	0.0	0.0	45.5	74.0	-28.6	H	P	
4.824	3.0	35.5	33.1	6.8	-34.1	0.0	0.0	41.3	54.0	-12.7	H	A	
12.060	3.0	33.3	39.4	11.9	-32.5	0.0	0.0	52.1	74.0	-21.9	H	P	
12.060	3.0	23.0	39.4	11.9	-32.5	0.0	0.0	41.8	54.0	-12.2	H	A	
4.824	3.0	38.1	33.1	6.8	-34.1	0.0	0.0	43.9	74.0	-30.1	V	P	
4.824	3.0	31.9	33.1	6.8	-34.1	0.0	0.0	37.7	54.0	-16.3	V	A	
12.060	3.0	33.0	39.4	11.9	-32.5	0.0	0.0	51.8	74.0	-22.2	V	P	
12.060	3.0	22.6	39.4	11.9	-32.5	0.0	0.0	41.5	54.0	-12.5	V	A	
Mid Ch_2437MHz													
4.874	3.0	40.6	33.1	6.8	-34.0	0.0	0.0	46.5	74.0	-27.5	H	P	
4.874	3.0	36.2	33.1	6.8	-34.0	0.0	0.0	42.1	54.0	-11.9	H	A	
7.311	3.0	34.7	35.8	9.1	-33.1	0.0	0.0	46.5	74.0	-27.5	H	P	
7.311	3.0	26.8	35.8	9.1	-33.1	0.0	0.0	38.6	54.0	-15.4	H	A	
4.874	3.0	36.1	33.1	6.8	-34.0	0.0	0.0	42.0	74.0	-32.0	V	P	
4.874	3.0	27.8	33.1	6.8	-34.0	0.0	0.0	33.7	54.0	-20.3	V	A	
7.311	3.0	34.4	35.8	9.1	-33.1	0.0	0.0	46.2	74.0	-27.8	V	P	
7.311	3.0	23.6	35.8	9.1	-33.1	0.0	0.0	35.4	54.0	-18.6	V	A	
High ch_2462MHz													
4.924	3.0	35.4	33.2	6.8	-34.0	0.0	0.0	41.4	74.0	-32.6	V	P	
4.924	3.0	25.2	33.2	6.8	-34.0	0.0	0.0	31.2	54.0	-22.8	V	A	
7.386	3.0	34.2	35.9	9.1	-33.1	0.0	0.0	46.2	74.0	-27.8	V	P	
7.386	3.0	23.8	35.9	9.1	-33.1	0.0	0.0	35.8	54.0	-18.2	V	A	
4.924	3.0	40.7	33.2	6.8	-34.0	0.0	0.0	46.7	74.0	-27.3	H	P	
4.924	3.0	36.4	33.2	6.8	-34.0	0.0	0.0	42.4	54.0	-11.6	H	A	
7.386	3.0	34.4	35.9	9.1	-33.1	0.0	0.0	46.4	74.0	-27.6	H	P	
7.386	3.0	26.6	35.9	9.1	-33.1	0.0	0.0	38.5	54.0	-15.5	H	A	

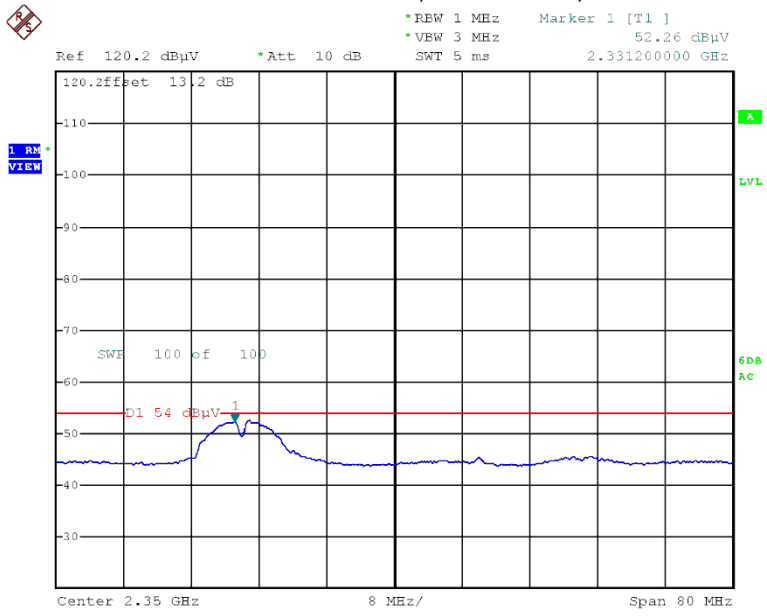
Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

9.3. TX ABOVE 1 GHz 802.11b CDD 2TX MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL) CH1

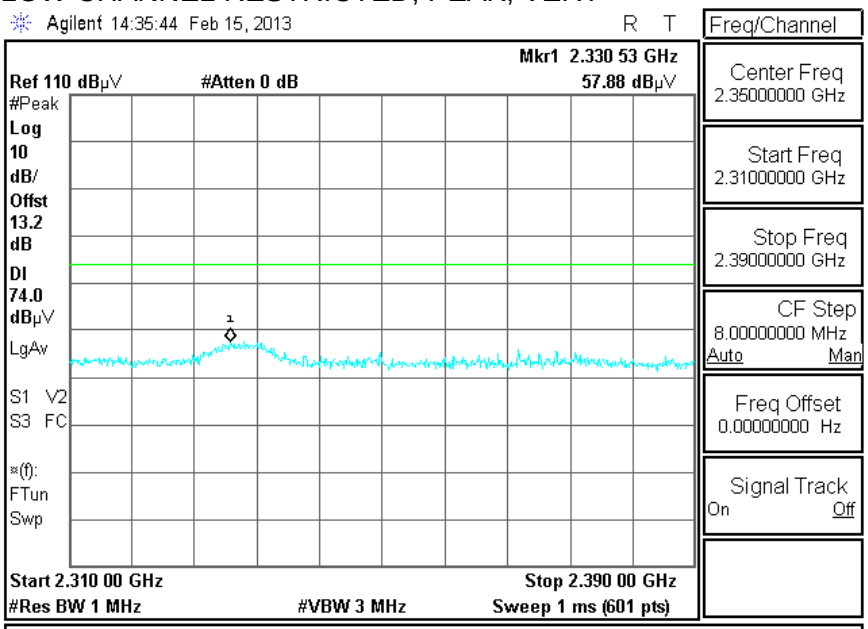


LOW CHANNEL RESTRICTED, AVERAGE, HORIZ

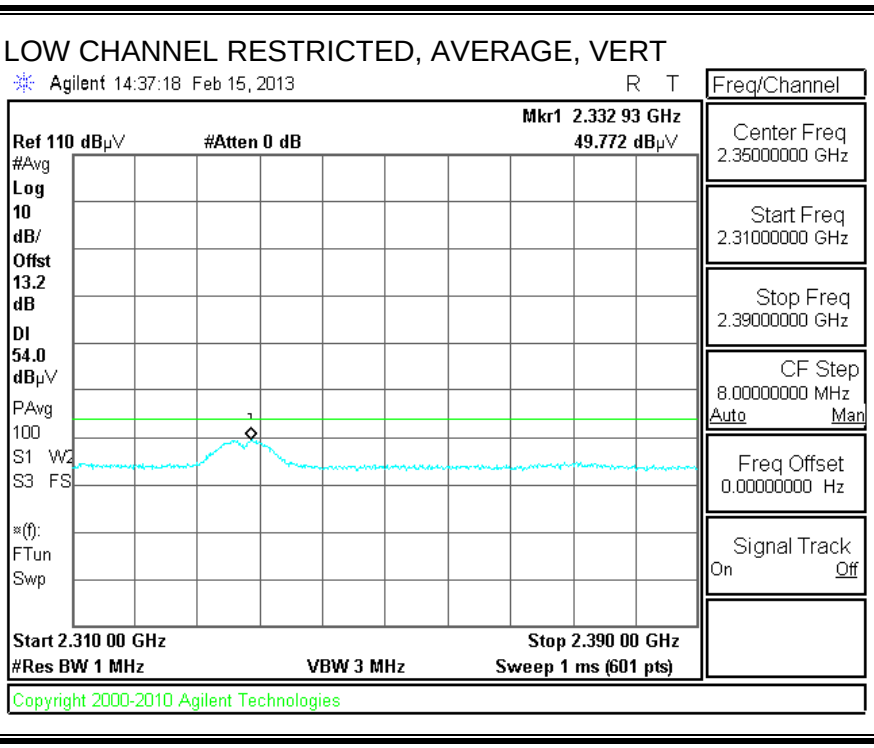


Date: 15.FEB.2013 14:59:55

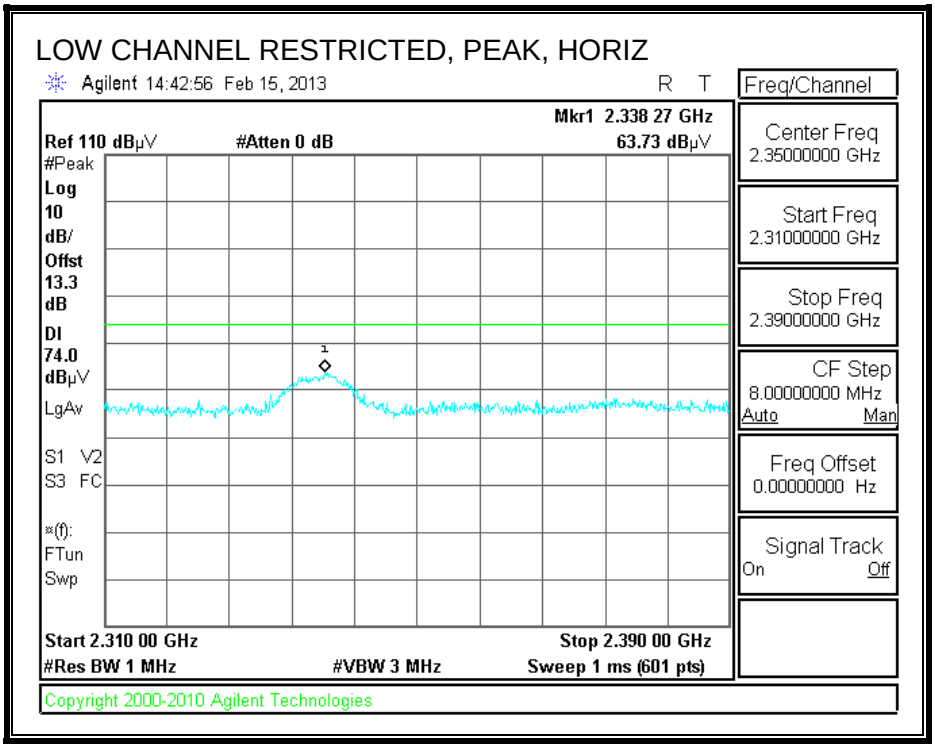
LOW CHANNEL RESTRICTED, PEAK, VERT

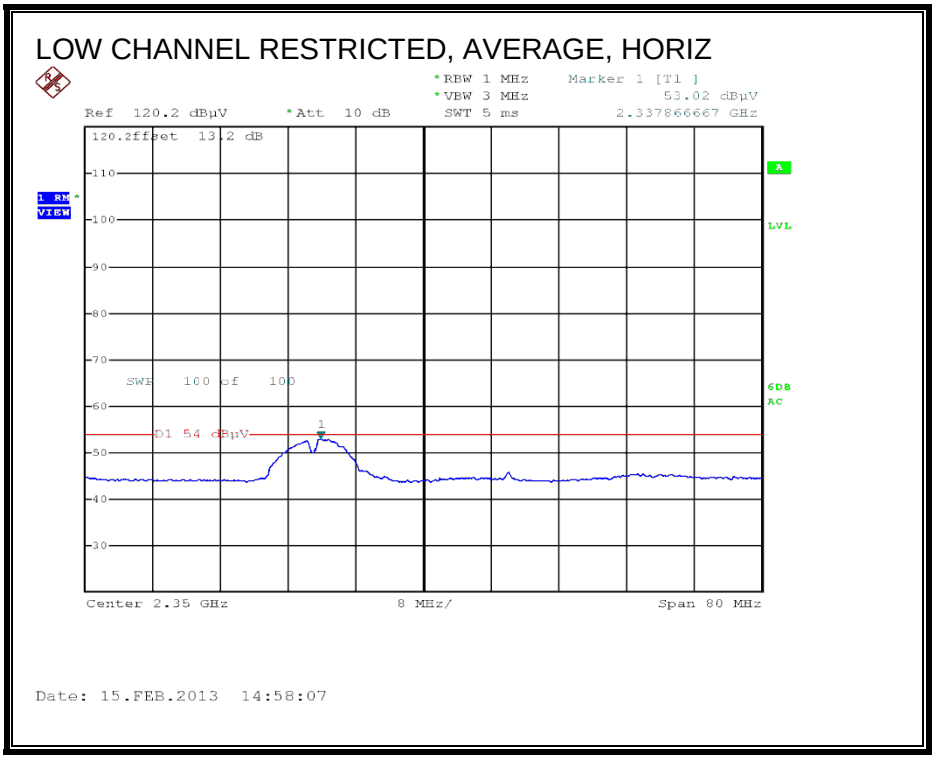


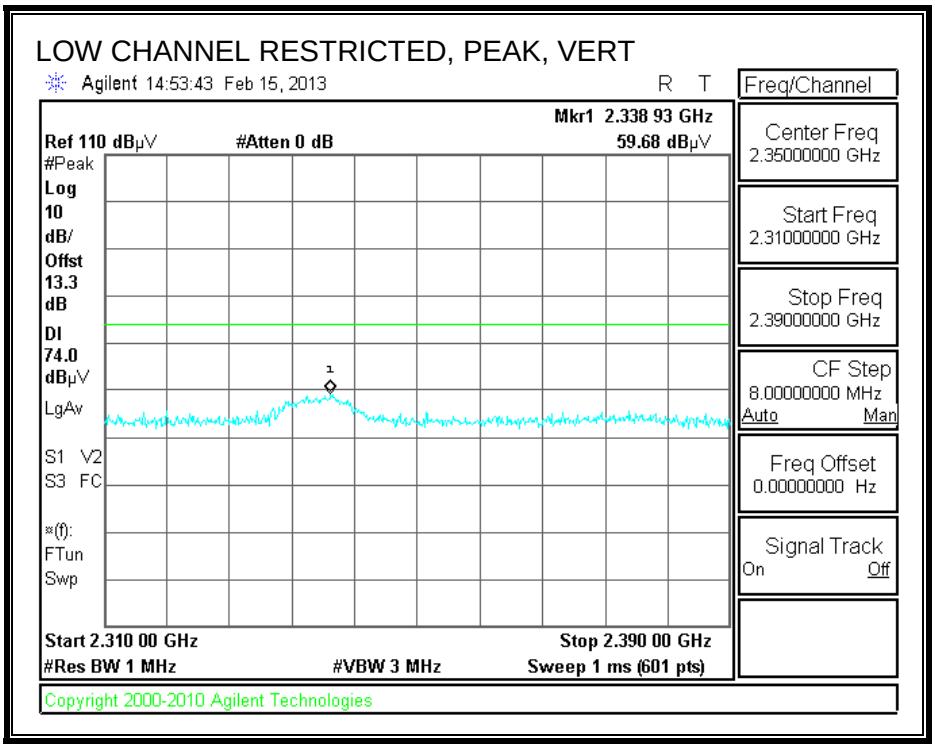
LOW CHANNEL RESTRICTED, AVERAGE, VERT

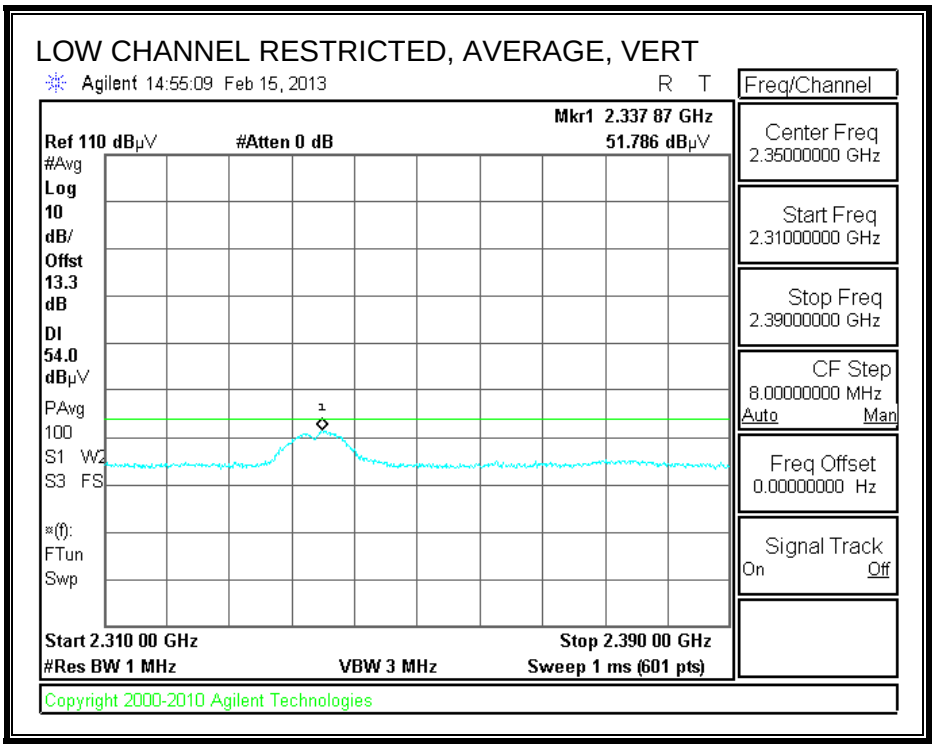


RESTRICTED BANDEDGE (LOW CHANNEL) CH2

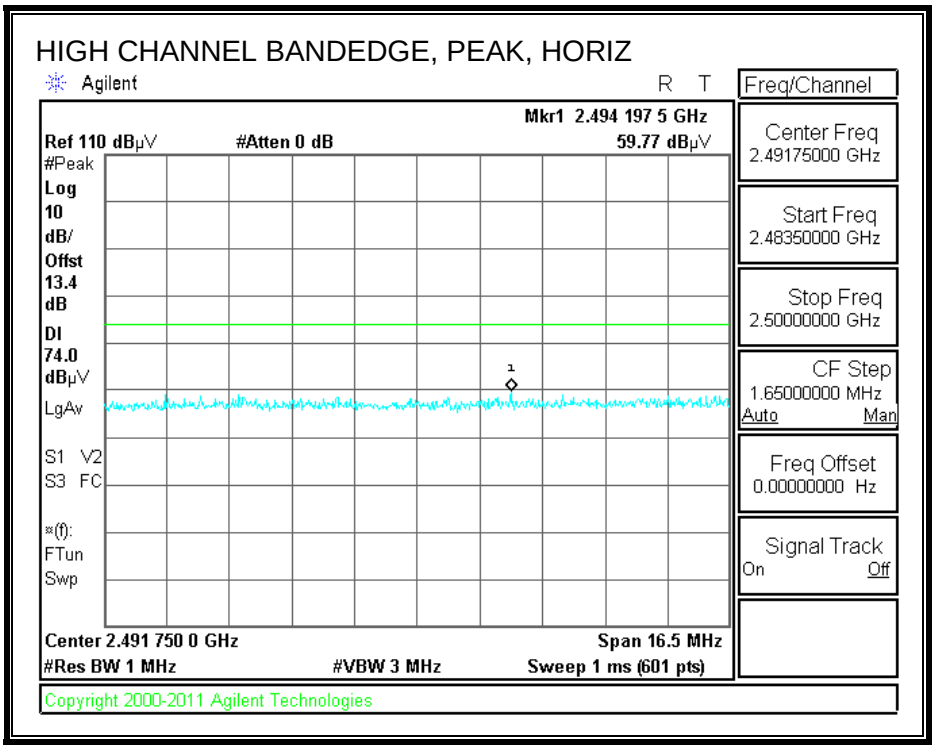


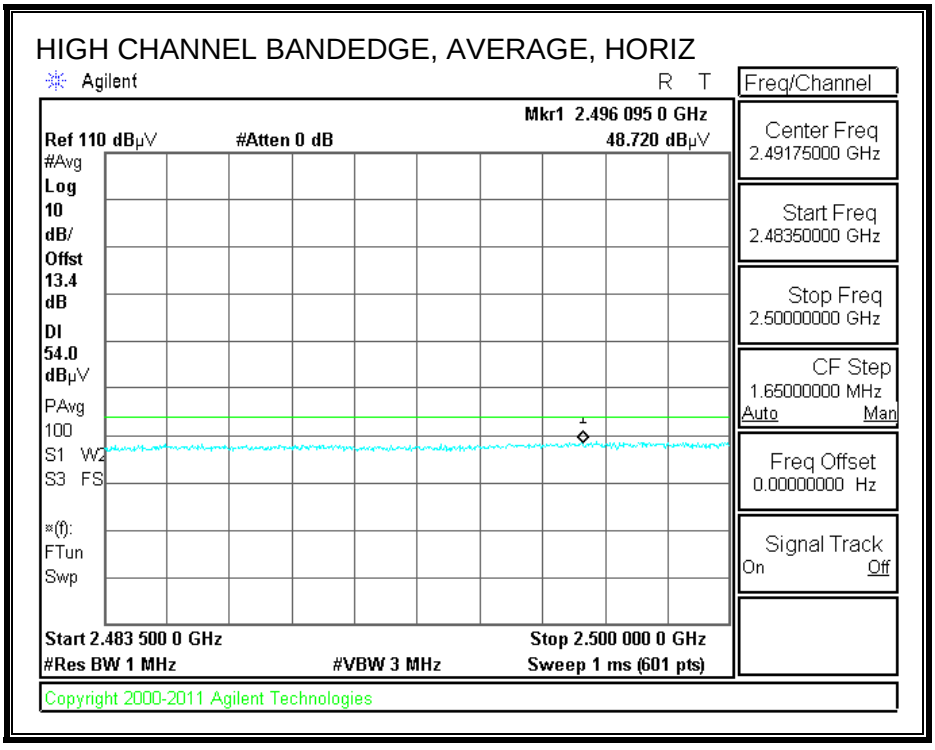




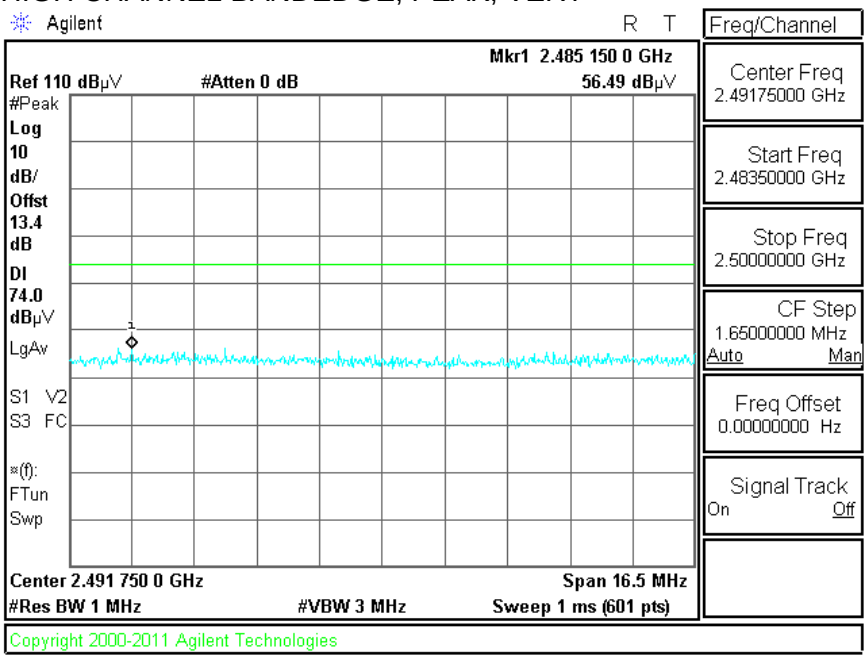


AUTHORIZED BANDEDGE (HIGH CHANNEL) CH10

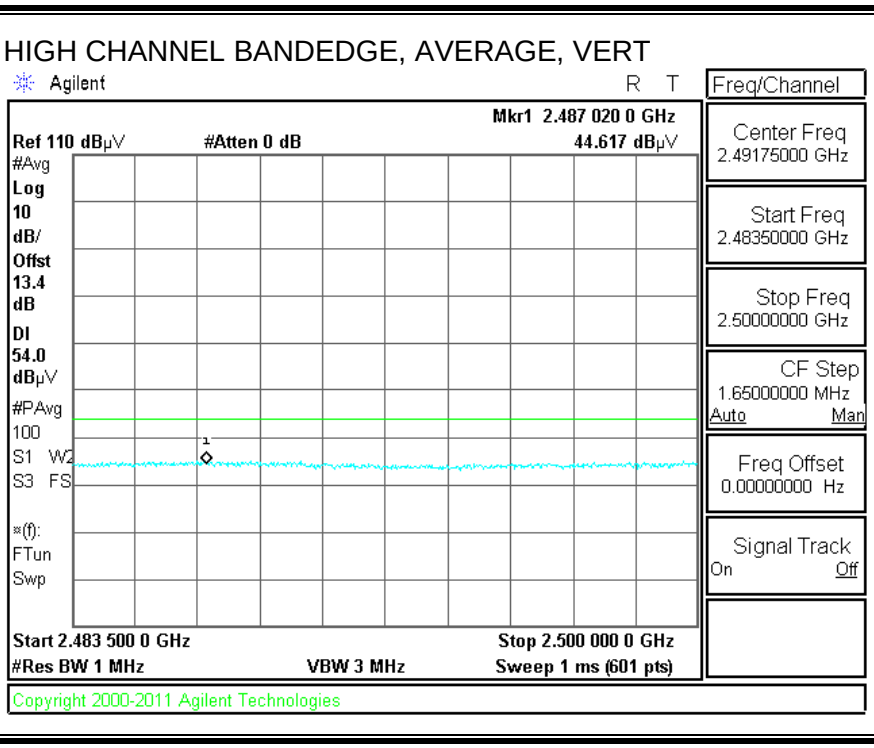




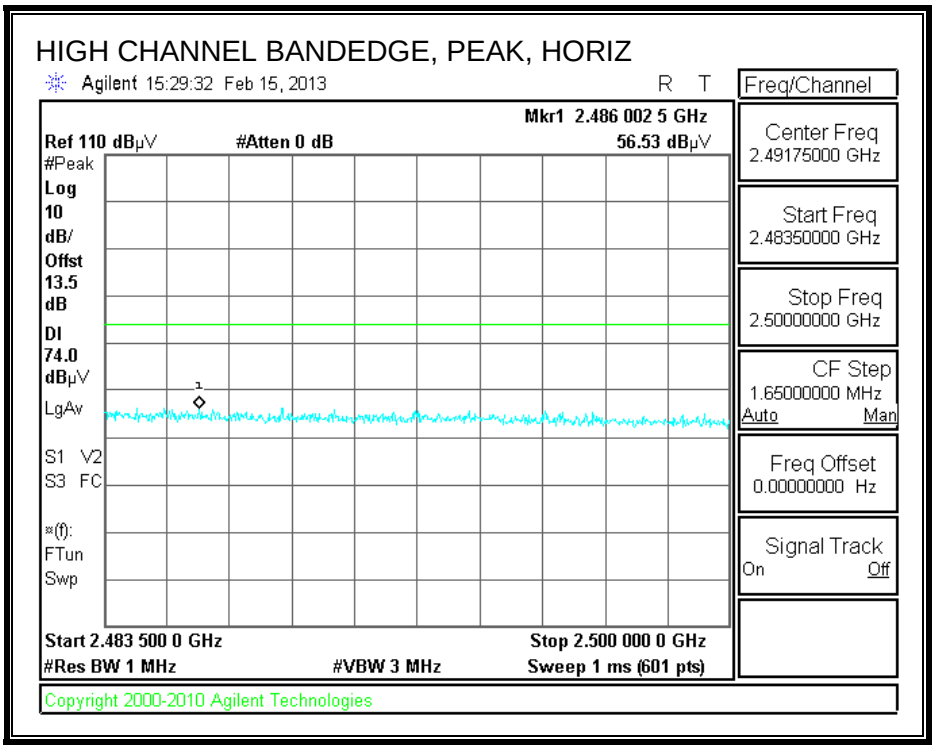
HIGH CHANNEL BANDEDGE, PEAK, VERT

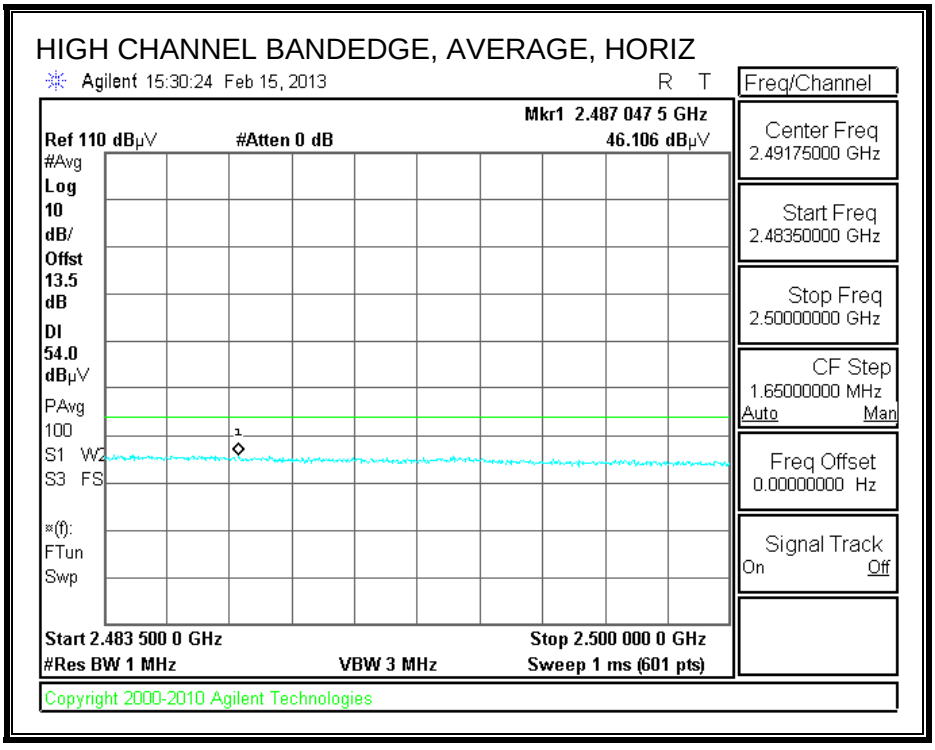


HIGH CHANNEL BANDEDGE, AVERAGE, VERT

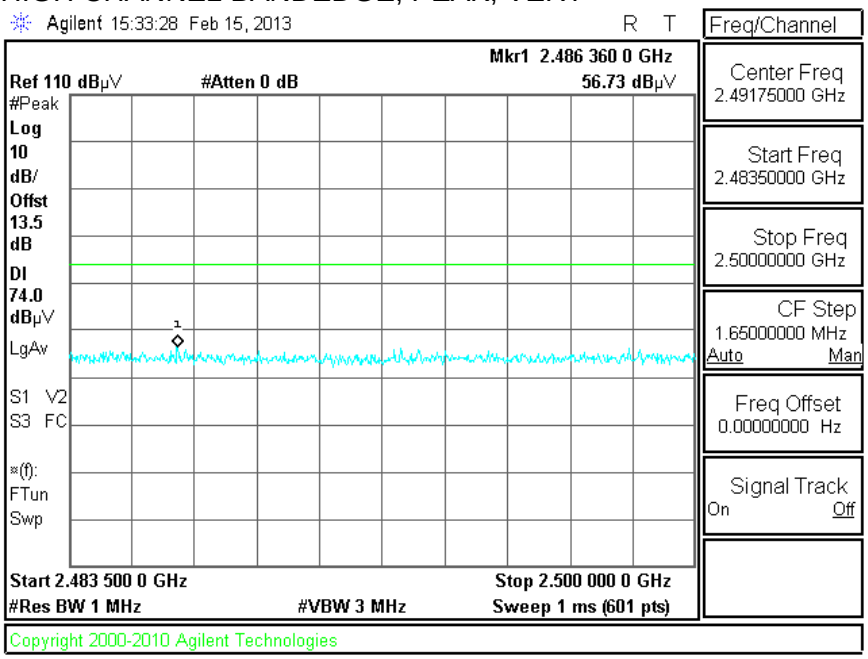


AUTHORIZED BANDEDGE (HIGH CHANNEL) CH11

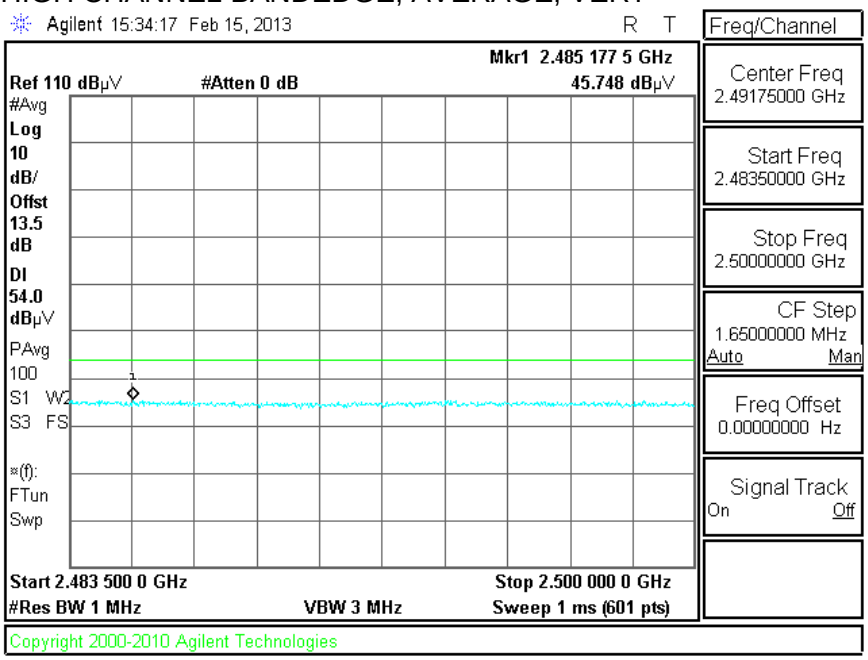




HIGH CHANNEL BANDEDGE, PEAK, VERT



HIGH CHANNEL BANDEDGE, AVERAGE, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Oliver Su
Date: 02/18/13
Project #: 12U14745
Company: Apple
Test Target:
Mode Oper: 11b 3Tx Power= 24 dBm per Chain

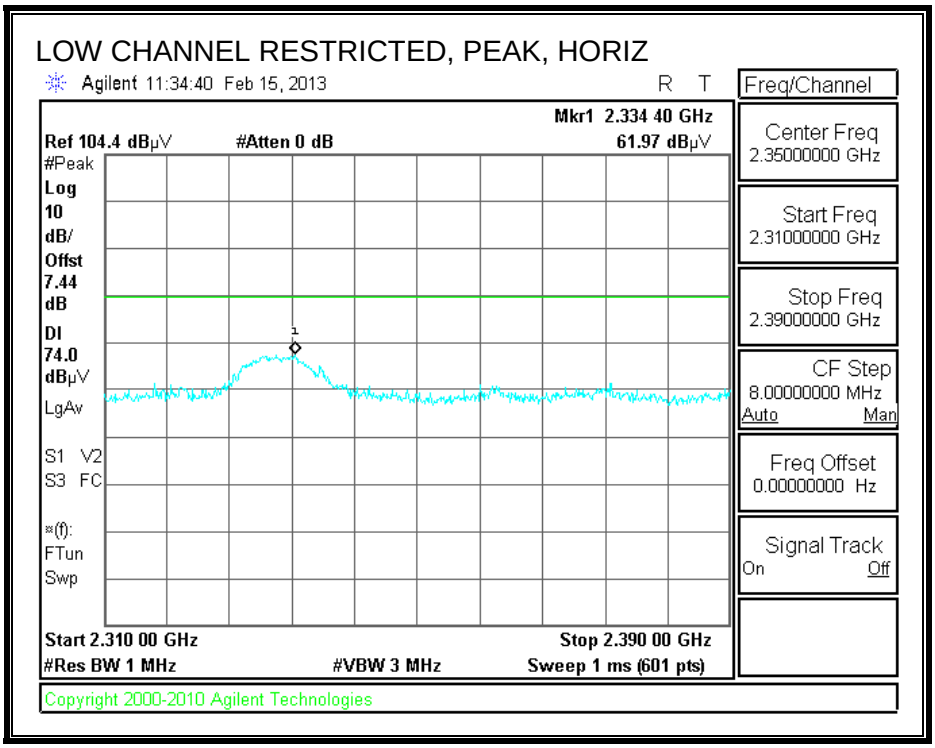
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch_2412MHz													
4.824	3.0	39.6	33.1	6.8	-34.1	0.0	0.0	45.5	74.0	-28.6	H	P	
4.824	3.0	35.5	33.1	6.8	-34.1	0.0	0.0	41.3	54.0	-12.7	H	A	
12.060	3.0	33.3	39.4	11.9	-32.5	0.0	0.0	52.1	74.0	-21.9	H	P	
12.060	3.0	23.0	39.4	11.9	-32.5	0.0	0.0	41.8	54.0	-12.2	H	A	
4.824	3.0	38.1	33.1	6.8	-34.1	0.0	0.0	43.9	74.0	-30.1	V	P	
4.824	3.0	31.9	33.1	6.8	-34.1	0.0	0.0	37.7	54.0	-16.3	V	A	
12.060	3.0	33.0	39.4	11.9	-32.5	0.0	0.0	51.8	74.0	-22.2	V	P	
12.060	3.0	22.6	39.4	11.9	-32.5	0.0	0.0	41.5	54.0	-12.5	V	A	
Mid Ch_2437MHz													
4.874	3.0	40.6	33.1	6.8	-34.0	0.0	0.0	46.5	74.0	-27.5	H	P	
4.874	3.0	36.2	33.1	6.8	-34.0	0.0	0.0	42.1	54.0	-11.9	H	A	
7.311	3.0	34.7	35.8	9.1	-33.1	0.0	0.0	46.5	74.0	-27.5	H	P	
7.311	3.0	26.8	35.8	9.1	-33.1	0.0	0.0	38.6	54.0	-15.4	H	A	
4.874	3.0	36.1	33.1	6.8	-34.0	0.0	0.0	42.0	74.0	-32.0	V	P	
4.874	3.0	27.8	33.1	6.8	-34.0	0.0	0.0	33.7	54.0	-20.3	V	A	
7.311	3.0	34.4	35.8	9.1	-33.1	0.0	0.0	46.2	74.0	-27.8	V	P	
7.311	3.0	23.6	35.8	9.1	-33.1	0.0	0.0	35.4	54.0	-18.6	V	A	
High ch_2462MHz													
4.924	3.0	35.4	33.2	6.8	-34.0	0.0	0.0	41.4	74.0	-32.6	V	P	
4.924	3.0	25.2	33.2	6.8	-34.0	0.0	0.0	31.2	54.0	-22.8	V	A	
7.386	3.0	34.2	35.9	9.1	-33.1	0.0	0.0	46.2	74.0	-27.8	V	P	
7.386	3.0	23.8	35.9	9.1	-33.1	0.0	0.0	35.8	54.0	-18.2	V	A	
4.924	3.0	40.7	33.2	6.8	-34.0	0.0	0.0	46.7	74.0	-27.3	H	P	
4.924	3.0	36.4	33.2	6.8	-34.0	0.0	0.0	42.4	54.0	-11.6	H	A	
7.386	3.0	34.4	35.9	9.1	-33.1	0.0	0.0	46.4	74.0	-27.6	H	P	
7.386	3.0	26.6	35.9	9.1	-33.1	0.0	0.0	38.5	54.0	-15.5	H	A	

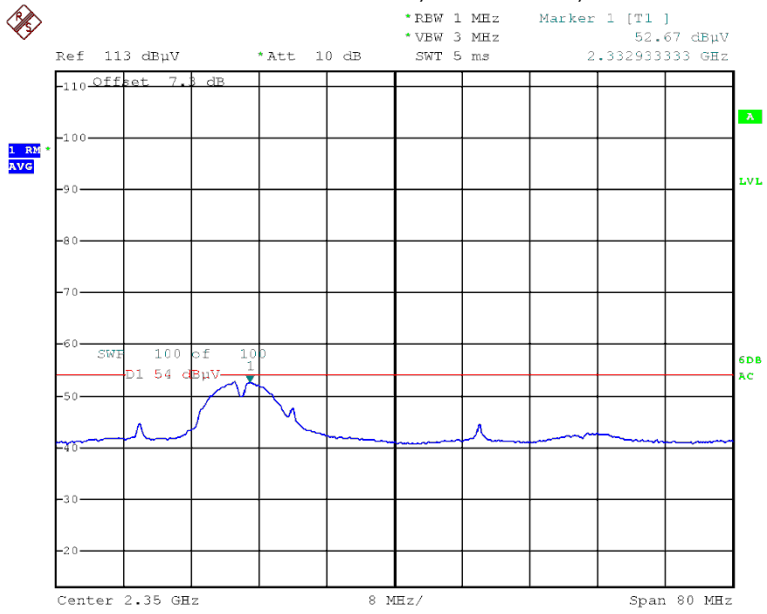
Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

9.4. TX ABOVE 1 GHz 802.11b CDD 3TX MODE IN THE 2.4 GHz BAND

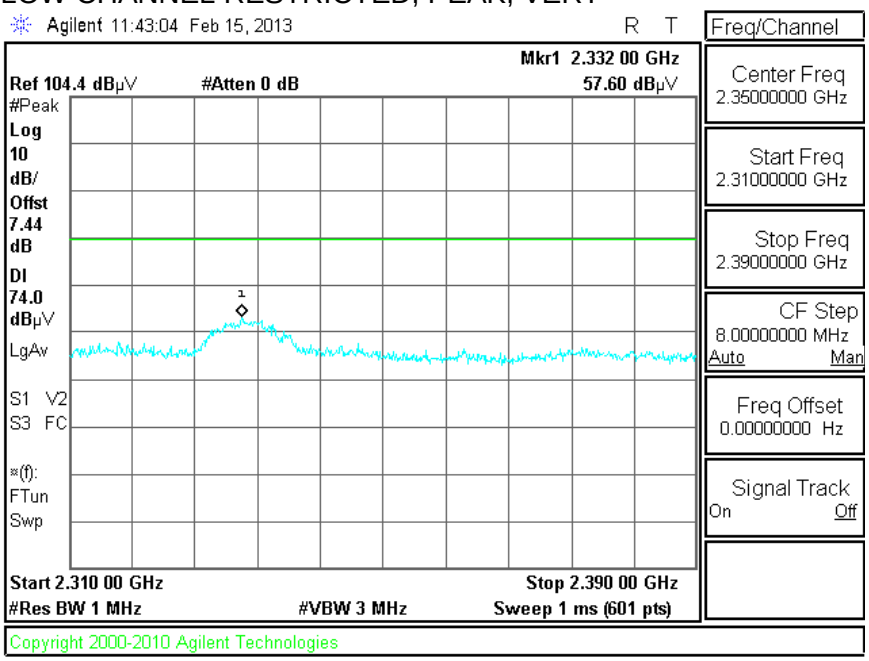
RESTRICTED BANDEDGE (LOW CHANNEL) CH1



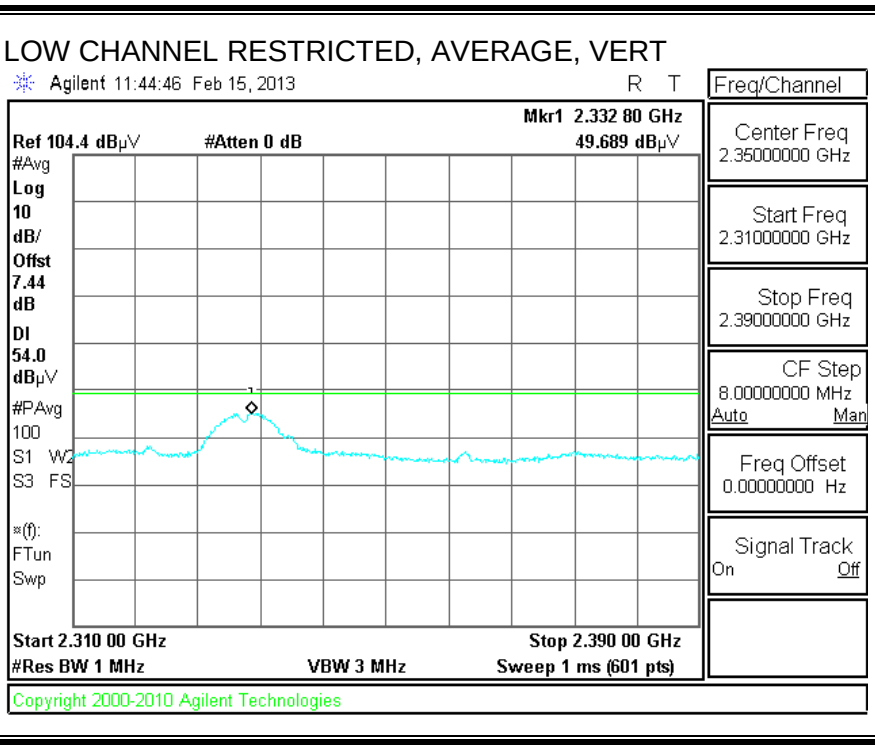
LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



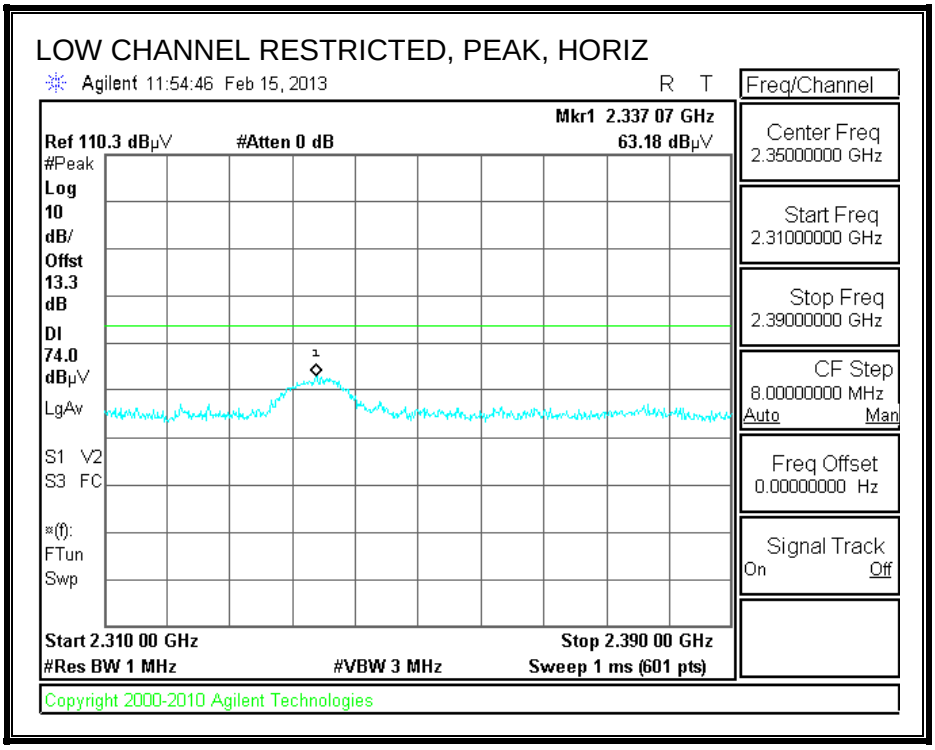
LOW CHANNEL RESTRICTED, PEAK, VERT

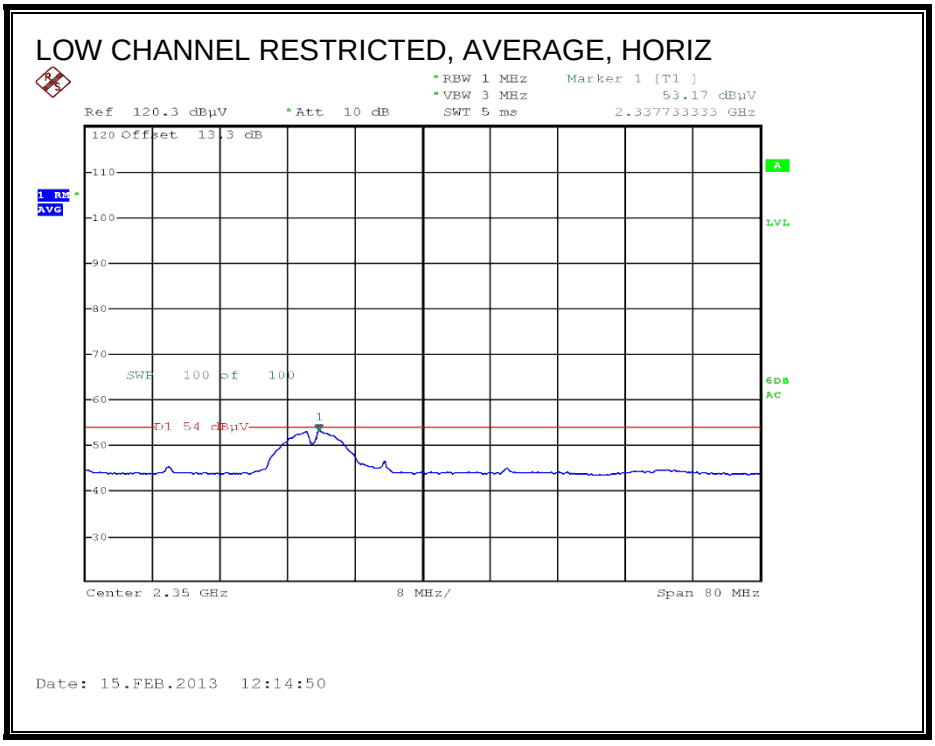


LOW CHANNEL RESTRICTED, AVERAGE, VERT

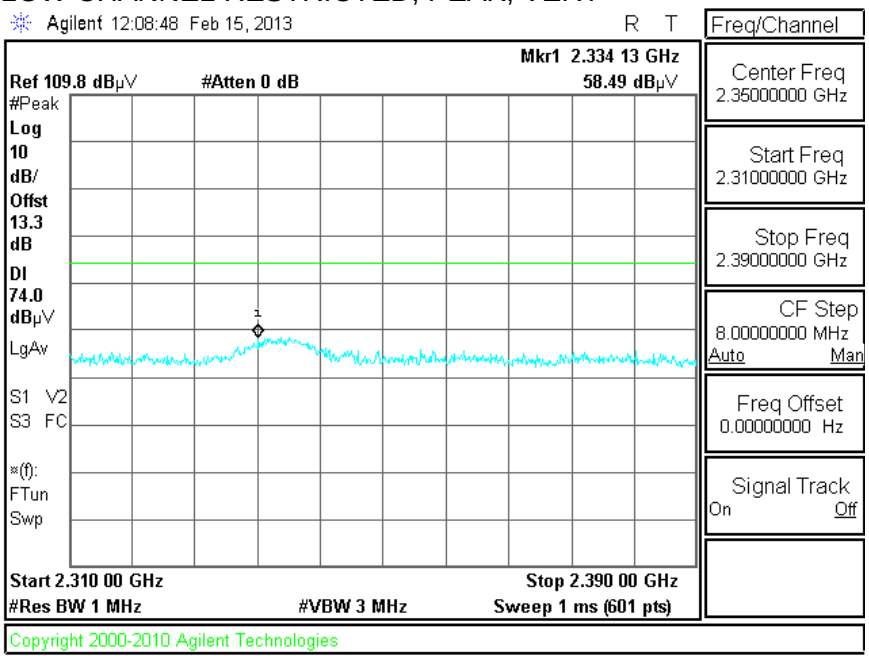


RESTRICTED BANDEDGE (LOW CHANNEL) CH2

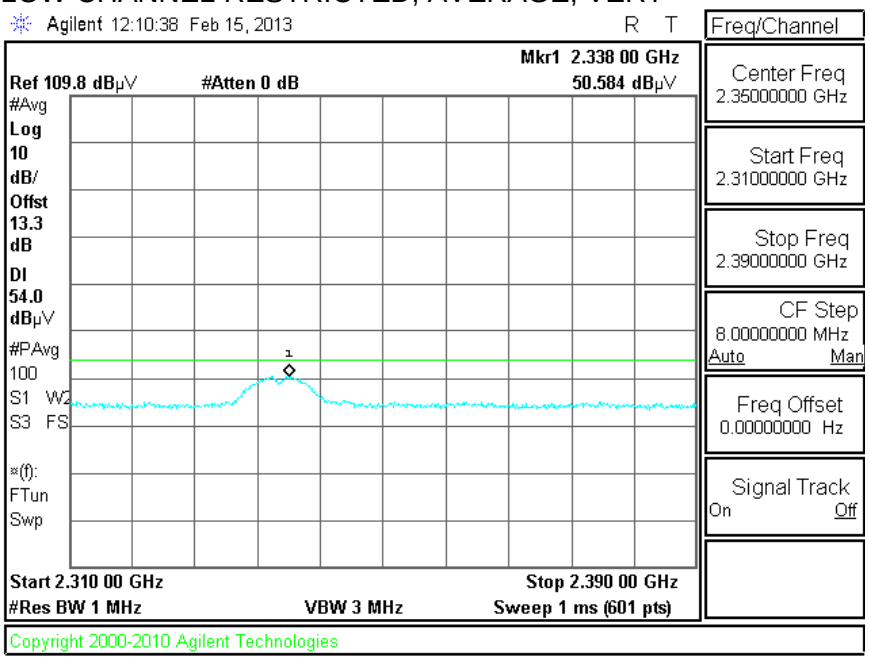




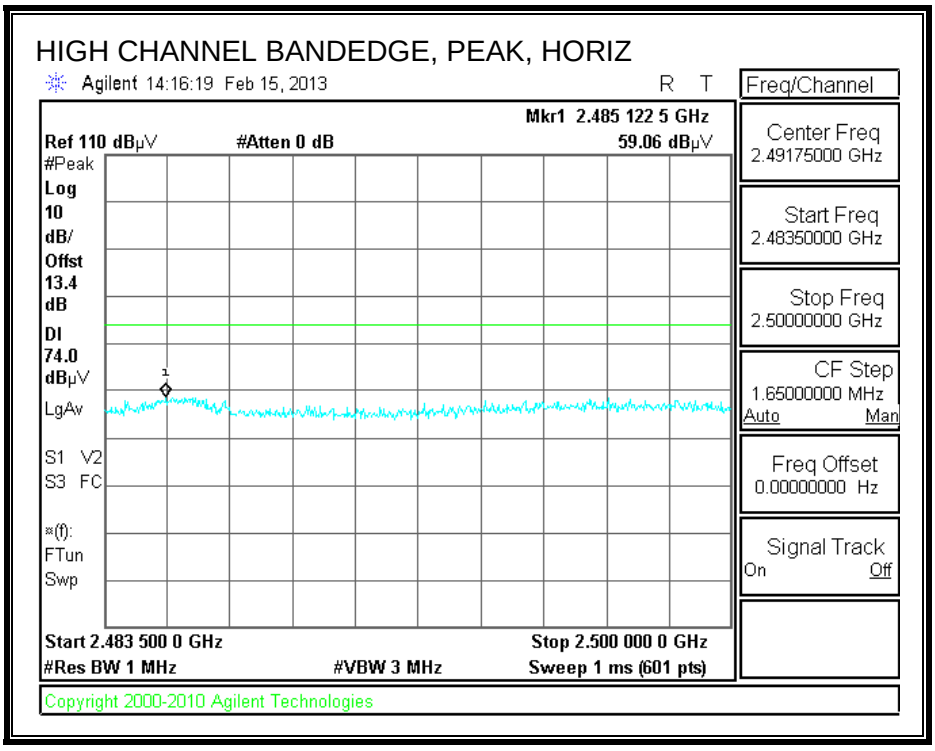
LOW CHANNEL RESTRICTED, PEAK, VERT

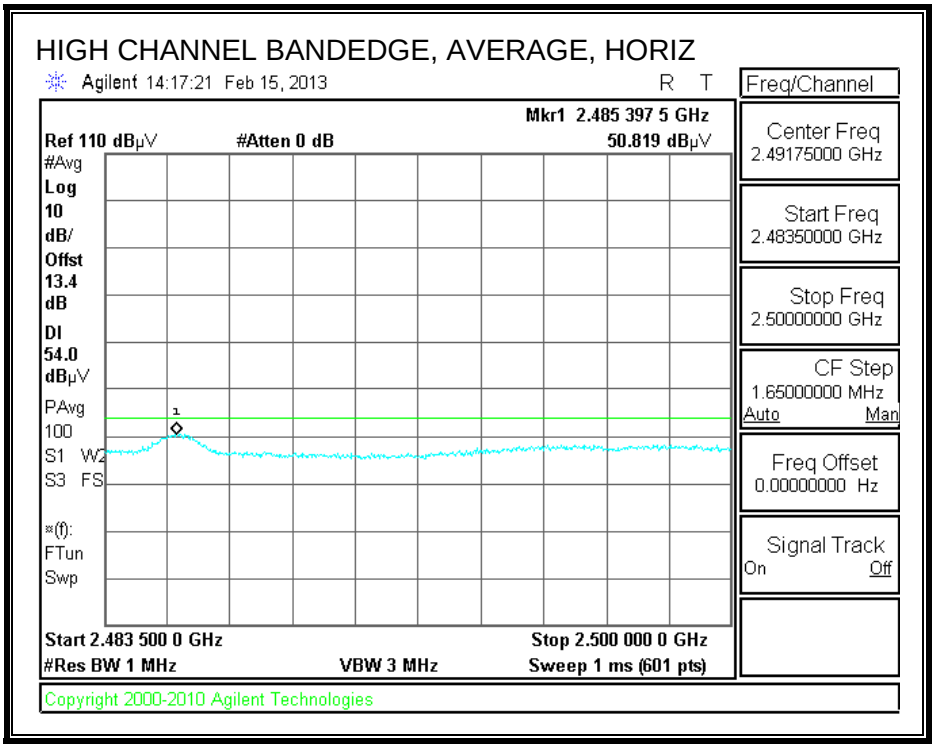


LOW CHANNEL RESTRICTED, AVERAGE, VERT

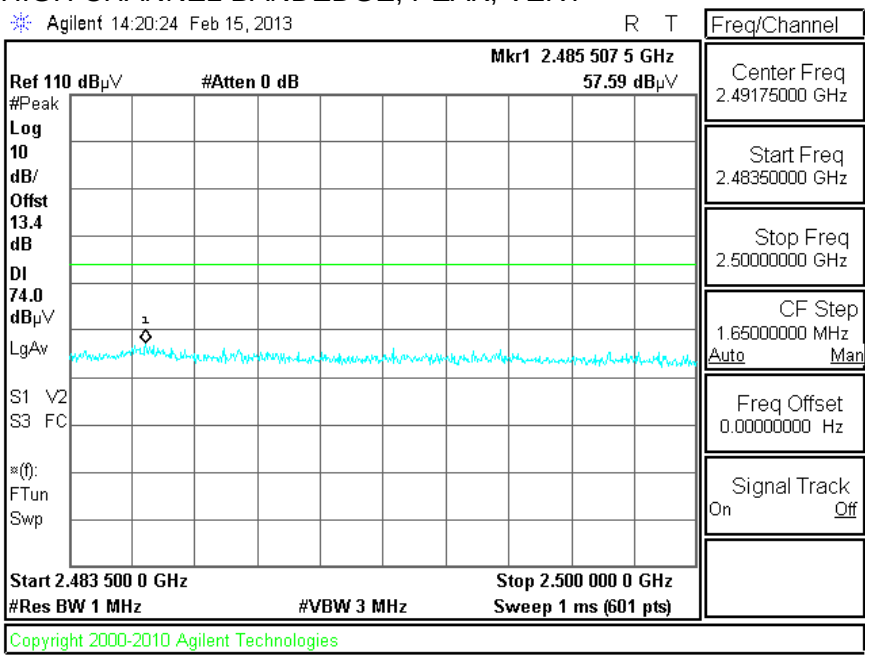


AUTHORIZED BANDEDGE (HIGH CHANNEL) CH10

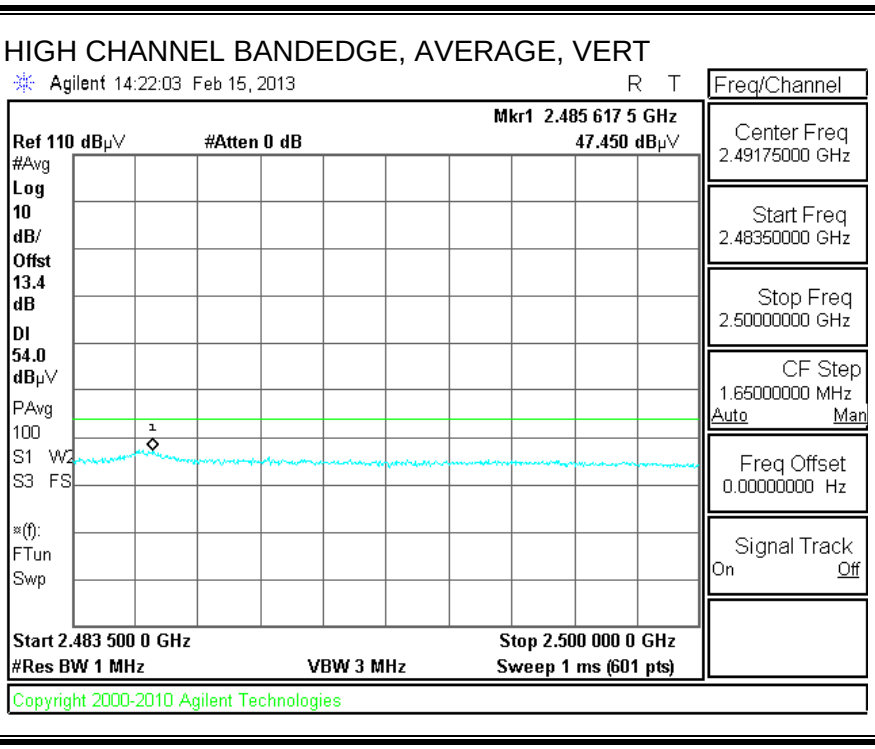




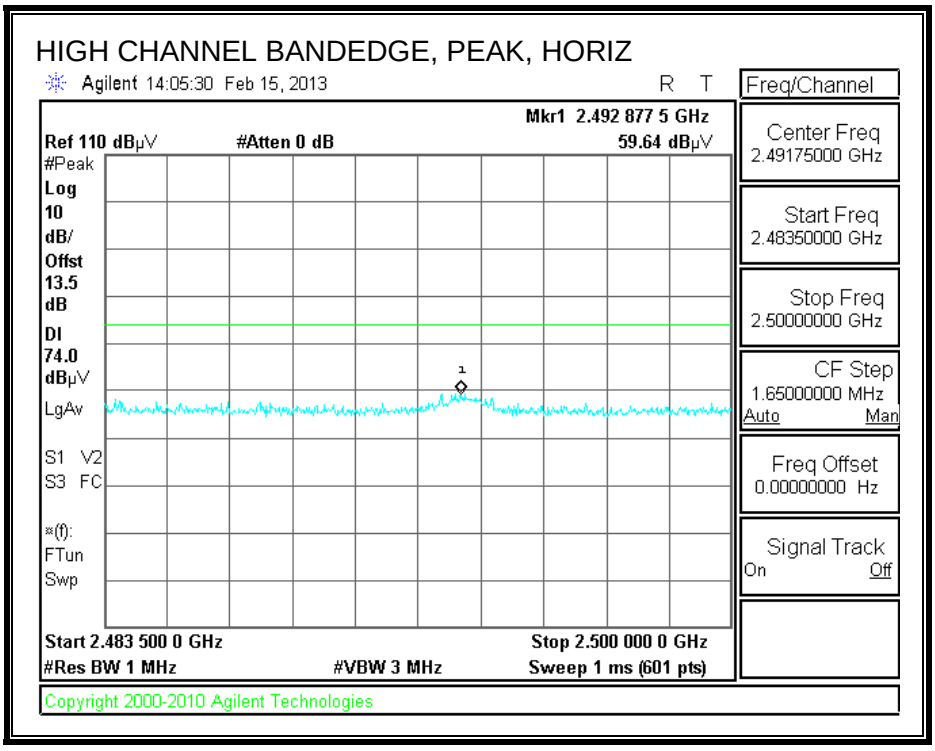
HIGH CHANNEL BANDEDGE, PEAK, VERT

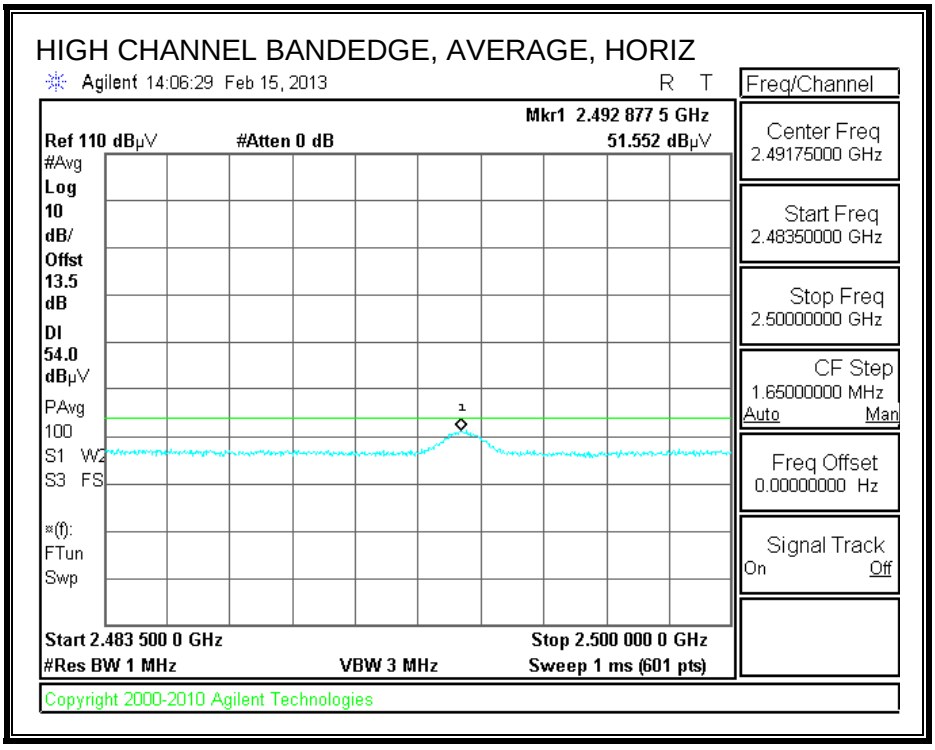


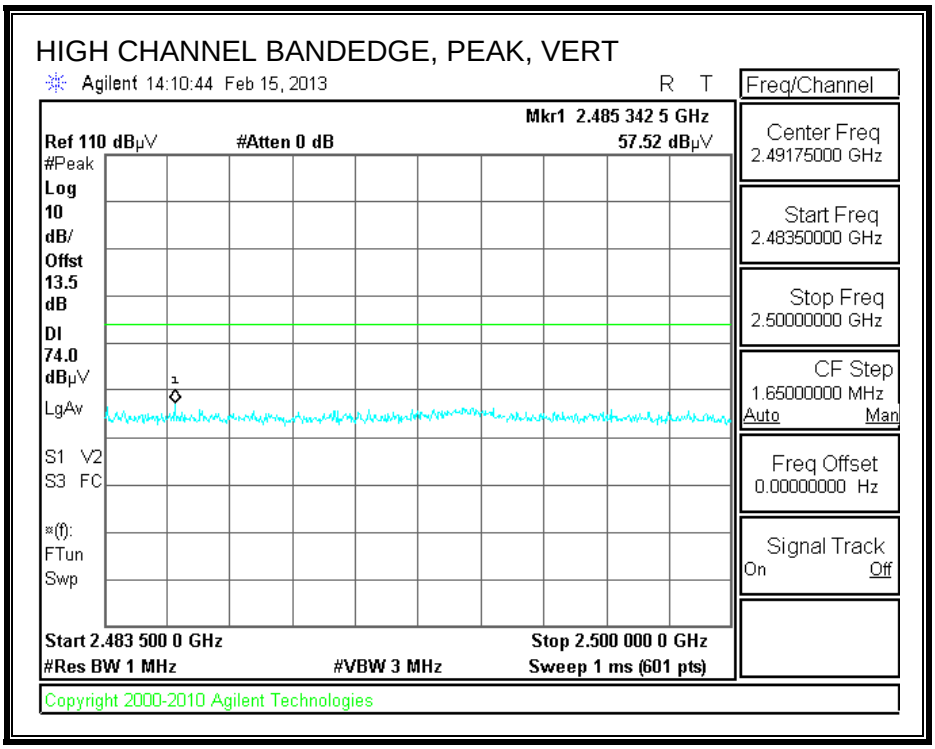
HIGH CHANNEL BANDEDGE, AVERAGE, VERT

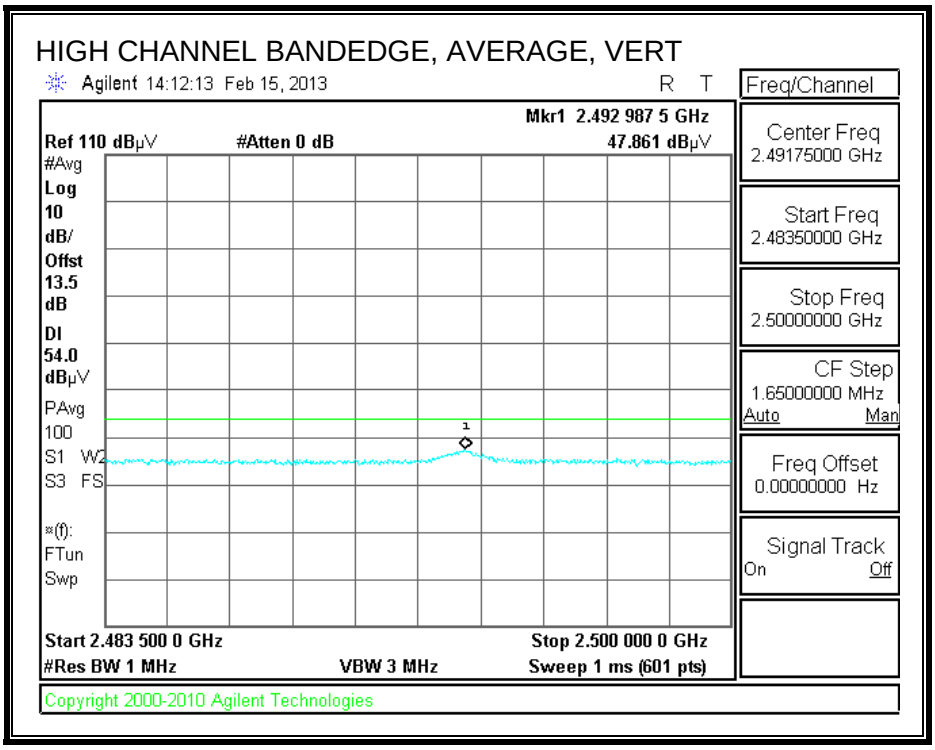


AUTHORIZED BANDEDGE (HIGH CHANNEL) CH11









HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Oliver Su
Date: 02/18/13
Project #: 12U14745
Company: Apple
Test Target:
Mode Oper: 11b 3Tx Power= 24 dBm per Chain

f	Measurement Frequency	Amp	Preamp Gain
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m
AF	Antenna Factor	Peak	Calculated Peak Field Strength
CL	Cable Loss	HPF	High Pass Filter

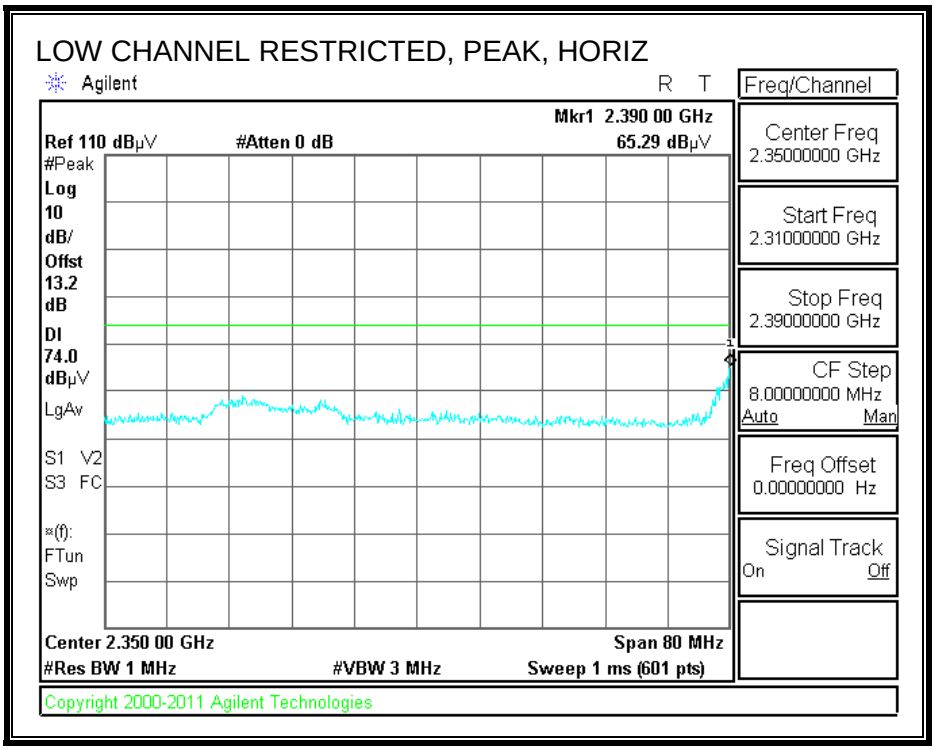
Average Field Strength Limit
Peak Field Strength Limit
Margin vs. Average Limit
Margin vs. Peak Limit

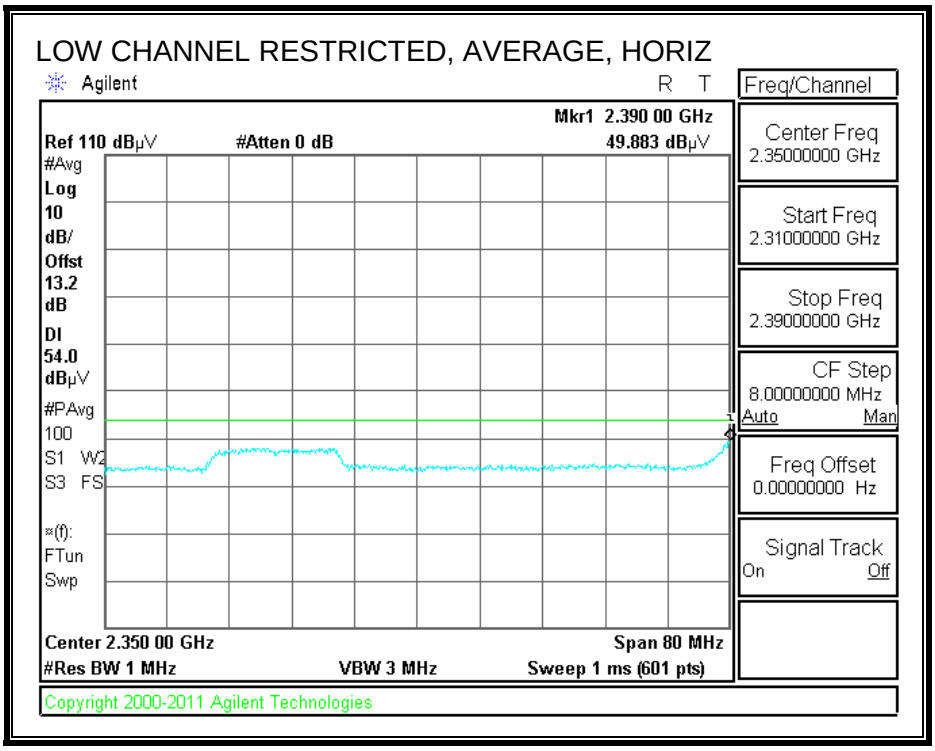
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch_2412MHz													
4.824	3.0	39.6	33.1	6.8	-34.1	0.0	0.0	45.5	74.0	-28.6	H	P	
4.824	3.0	35.5	33.1	6.8	-34.1	0.0	0.0	41.3	54.0	-12.7	H	A	
12.060	3.0	33.3	39.4	11.9	-32.5	0.0	0.0	52.1	74.0	-21.9	H	P	
12.060	3.0	23.0	39.4	11.9	-32.5	0.0	0.0	41.8	54.0	-12.2	H	A	
4.824	3.0	38.1	33.1	6.8	-34.1	0.0	0.0	43.9	74.0	-30.1	V	P	
4.824	3.0	31.9	33.1	6.8	-34.1	0.0	0.0	37.7	54.0	-16.3	V	A	
12.060	3.0	33.0	39.4	11.9	-32.5	0.0	0.0	51.8	74.0	-22.2	V	P	
12.060	3.0	22.6	39.4	11.9	-32.5	0.0	0.0	41.5	54.0	-12.5	V	A	
Mid Ch_2437MHz													
4.874	3.0	40.6	33.1	6.8	-34.0	0.0	0.0	46.5	74.0	-27.5	H	P	
4.874	3.0	36.2	33.1	6.8	-34.0	0.0	0.0	42.1	54.0	-11.9	H	A	
7.311	3.0	34.7	35.8	9.1	-33.1	0.0	0.0	46.5	74.0	-27.5	H	P	
7.311	3.0	26.8	35.8	9.1	-33.1	0.0	0.0	38.6	54.0	-15.4	H	A	
4.874	3.0	36.1	33.1	6.8	-34.0	0.0	0.0	42.0	74.0	-32.0	V	P	
4.874	3.0	27.8	33.1	6.8	-34.0	0.0	0.0	33.7	54.0	-20.3	V	A	
7.311	3.0	34.4	35.8	9.1	-33.1	0.0	0.0	46.2	74.0	-27.8	V	P	
7.311	3.0	23.6	35.8	9.1	-33.1	0.0	0.0	35.4	54.0	-18.6	V	A	
High ch_2462MHz													
4.924	3.0	35.4	33.2	6.8	-34.0	0.0	0.0	41.4	74.0	-32.6	V	P	
4.924	3.0	25.2	33.2	6.8	-34.0	0.0	0.0	31.2	54.0	-22.8	V	A	
7.386	3.0	34.2	35.9	9.1	-33.1	0.0	0.0	46.2	74.0	-27.8	V	P	
7.386	3.0	23.8	35.9	9.1	-33.1	0.0	0.0	35.8	54.0	-18.2	V	A	
4.924	3.0	40.7	33.2	6.8	-34.0	0.0	0.0	46.7	74.0	-27.3	H	P	
4.924	3.0	36.4	33.2	6.8	-34.0	0.0	0.0	42.4	54.0	-11.6	H	A	
7.386	3.0	34.4	35.9	9.1	-33.1	0.0	0.0	46.4	74.0	-27.6	H	P	
7.386	3.0	26.6	35.9	9.1	-33.1	0.0	0.0	38.5	54.0	-15.5	H	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

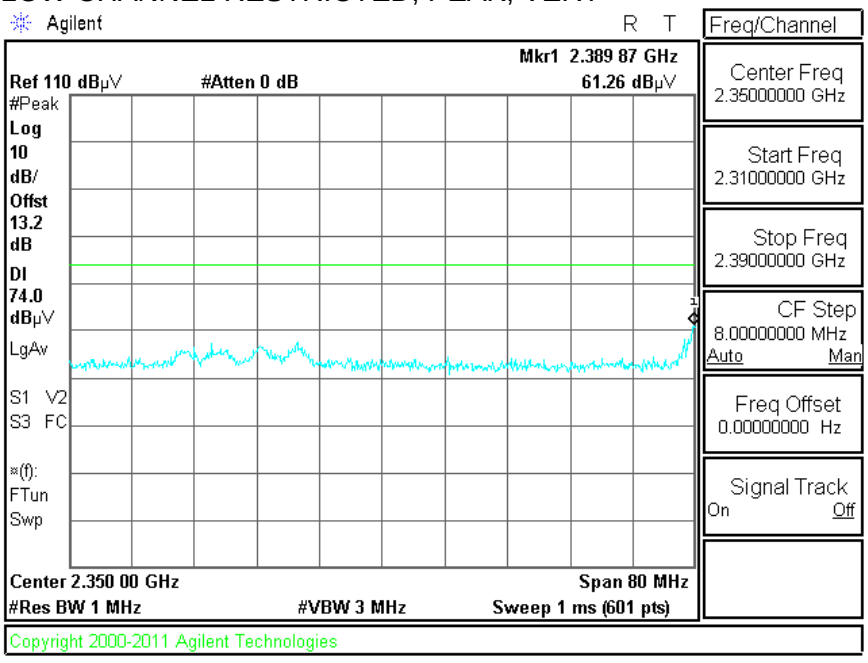
9.5. TX ABOVE 1 GHz 802.11g 1TX MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL) CH1

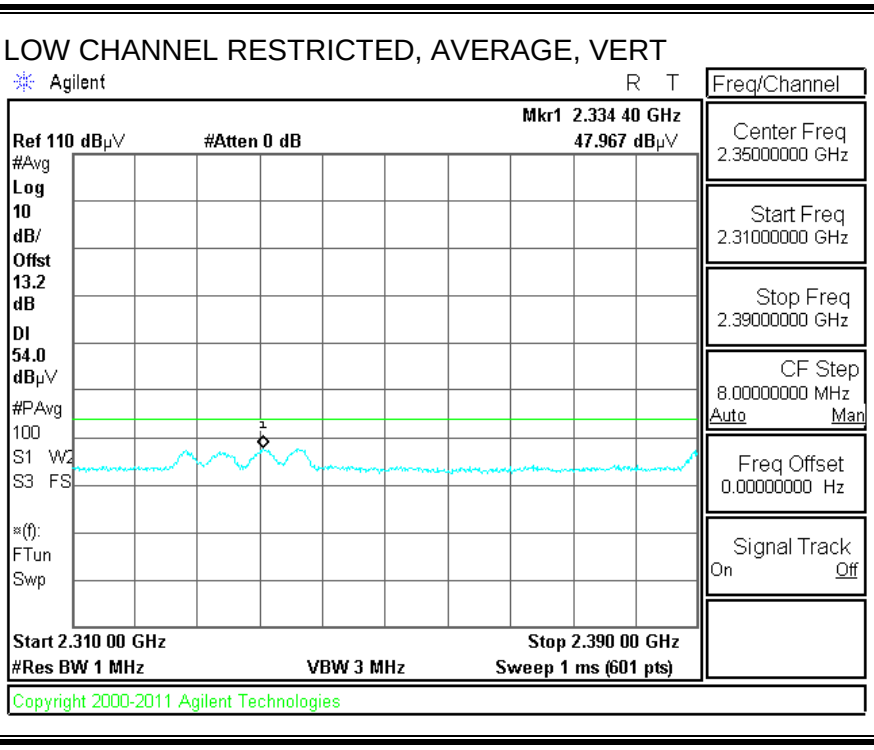




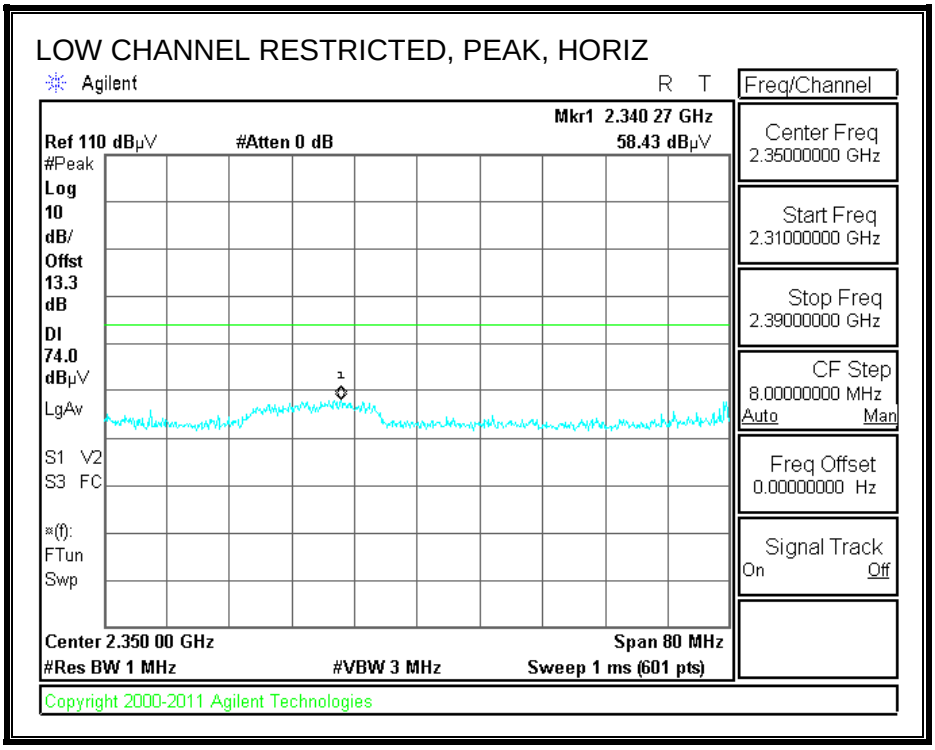
LOW CHANNEL RESTRICTED, PEAK, VERT

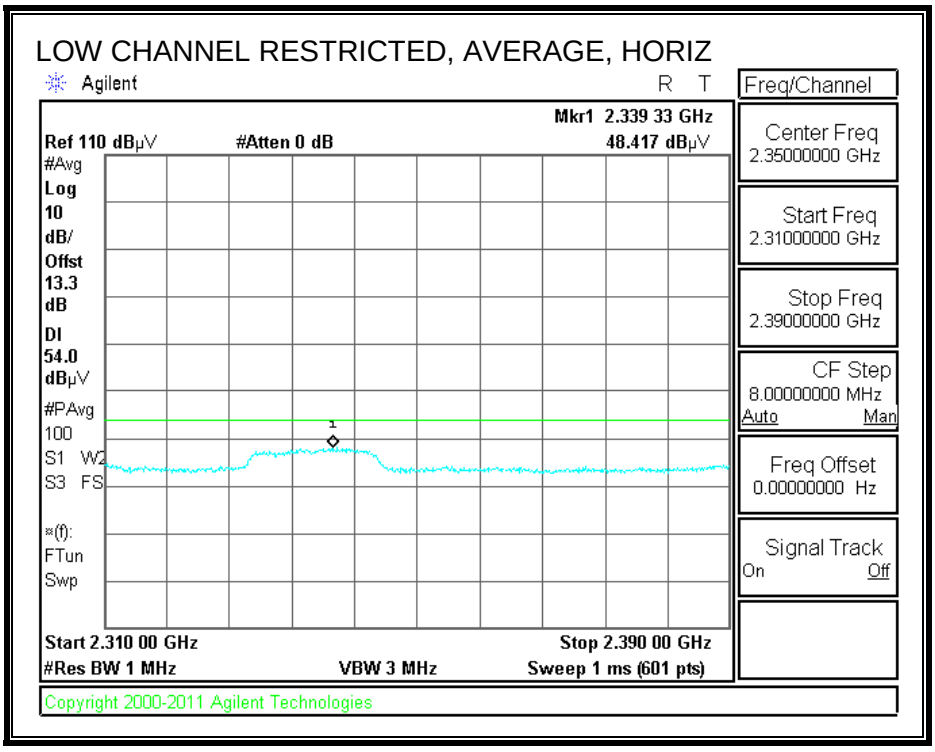


LOW CHANNEL RESTRICTED, AVERAGE, VERT

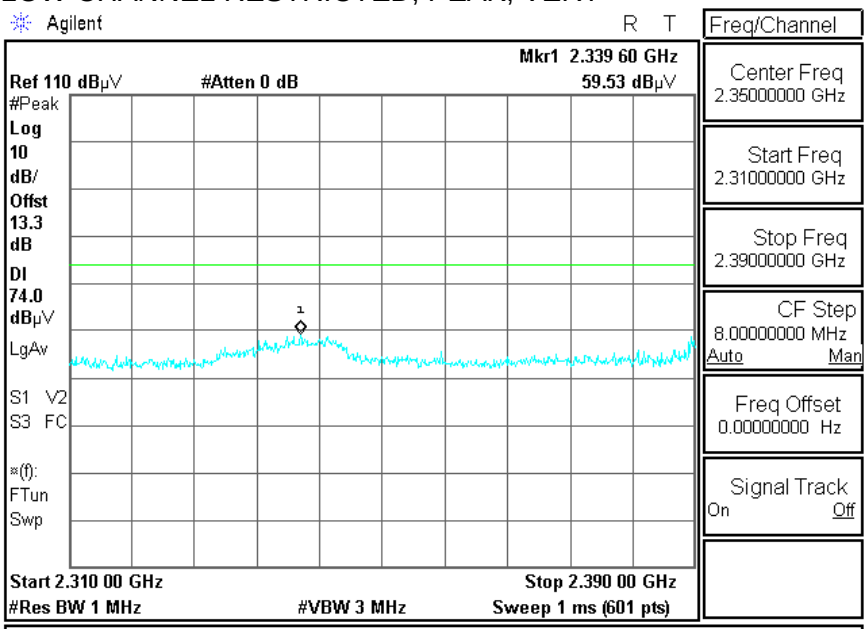


RESTRICTED BANDEDGE (LOW CHANNEL) CH2

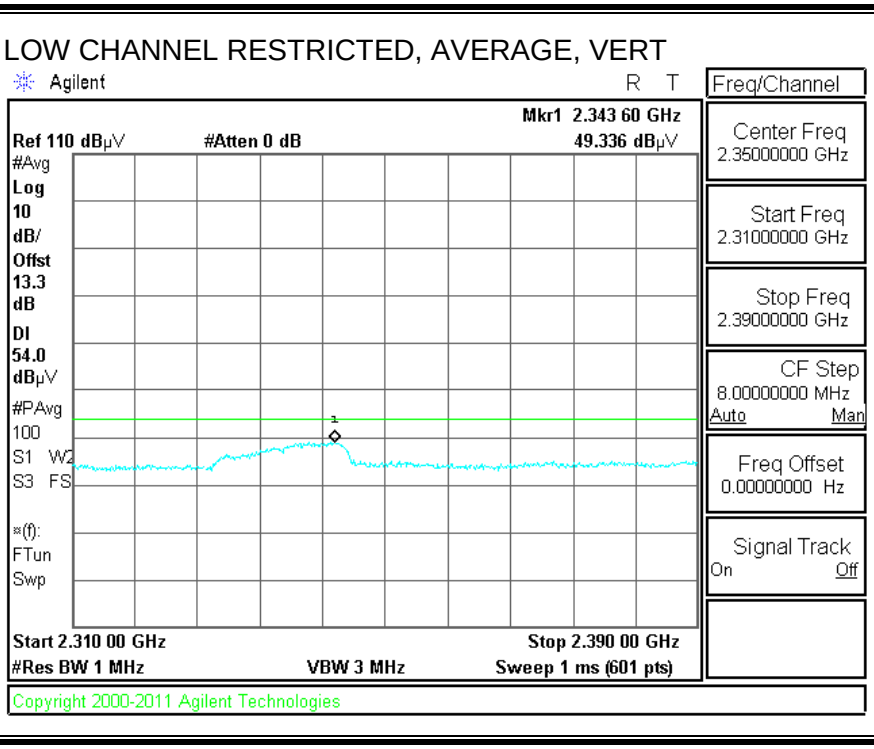




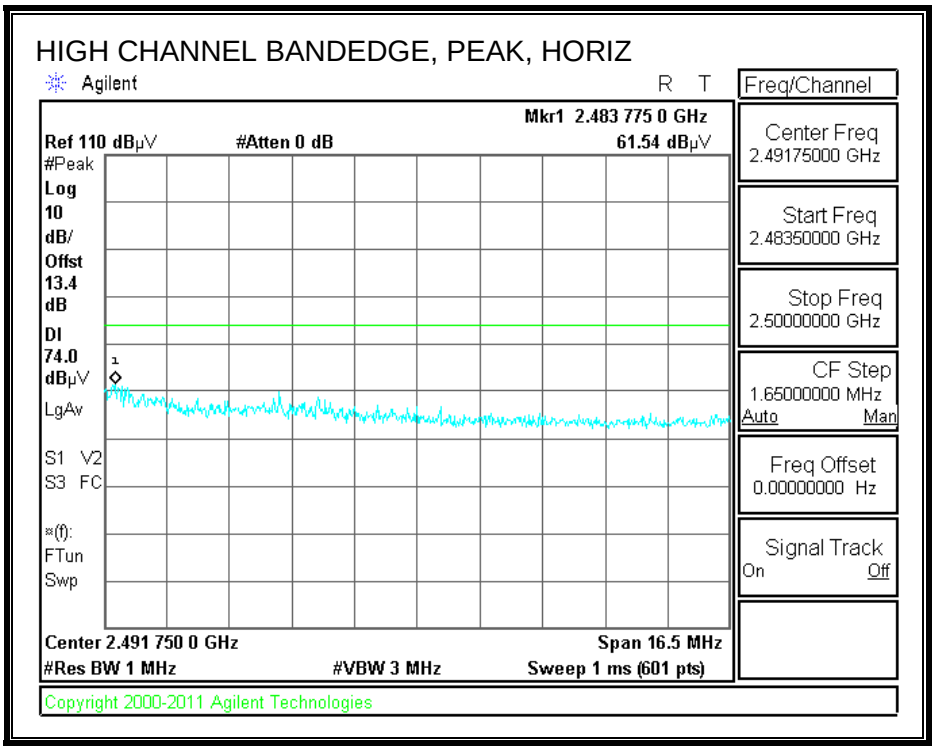
LOW CHANNEL RESTRICTED, PEAK, VERT

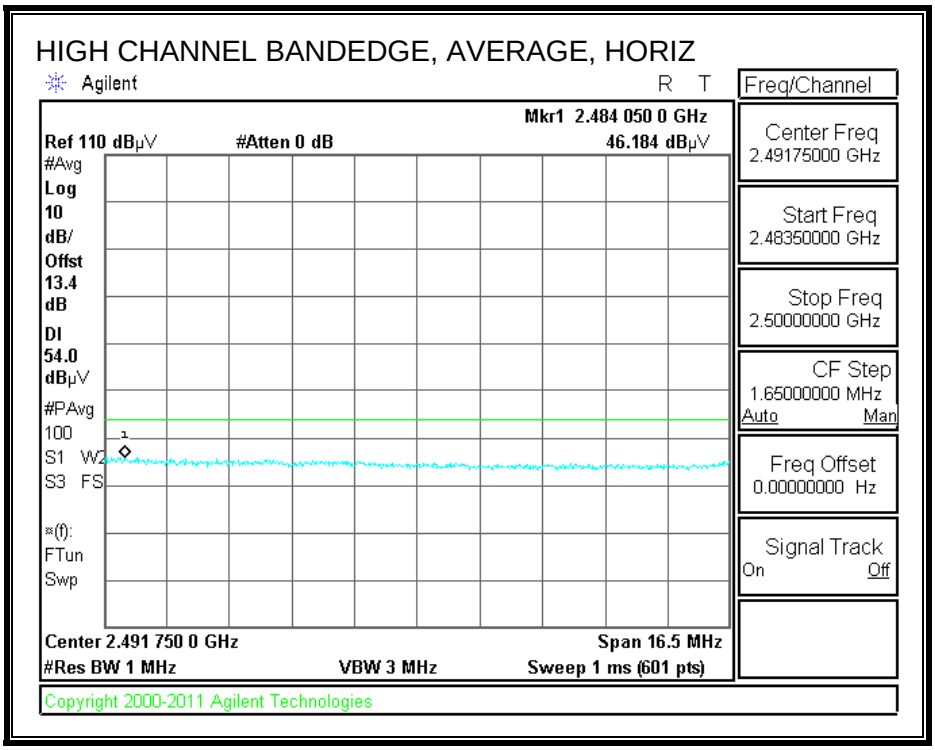


LOW CHANNEL RESTRICTED, AVERAGE, VERT

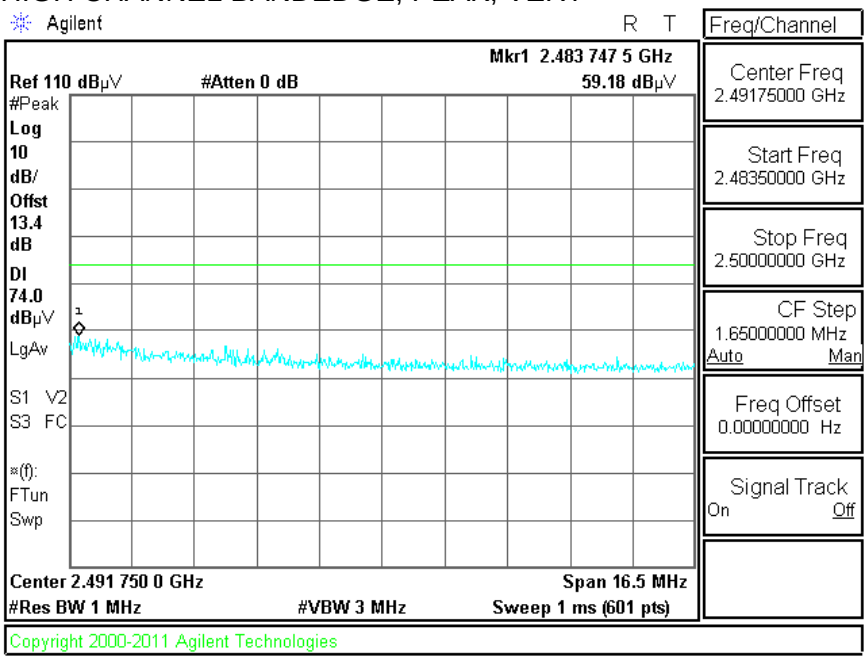


AUTHORIZED BANDEDGE (HIGH CHANNEL) CH10

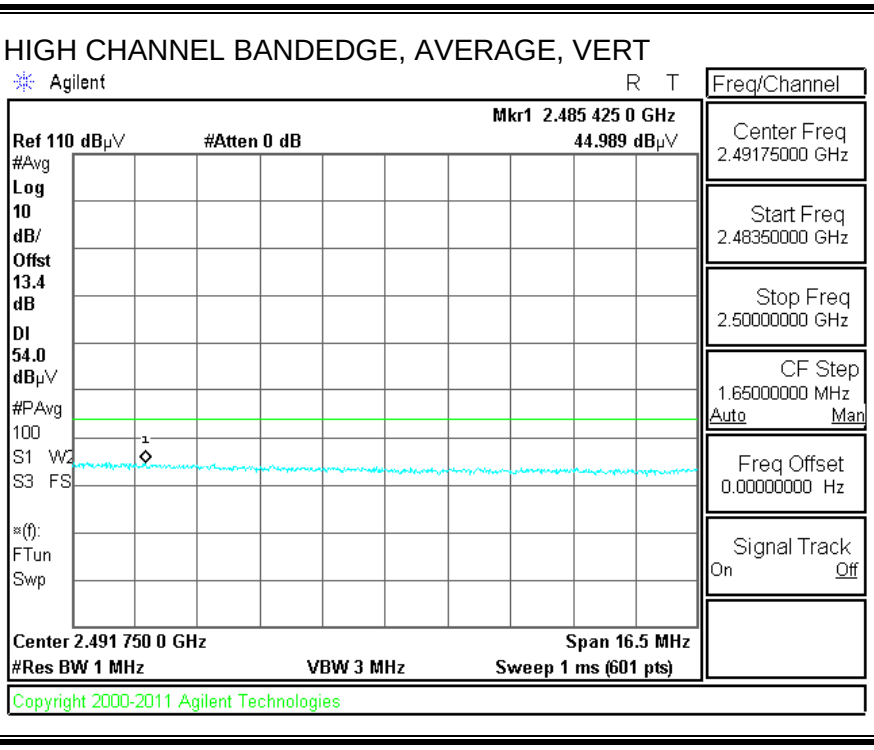




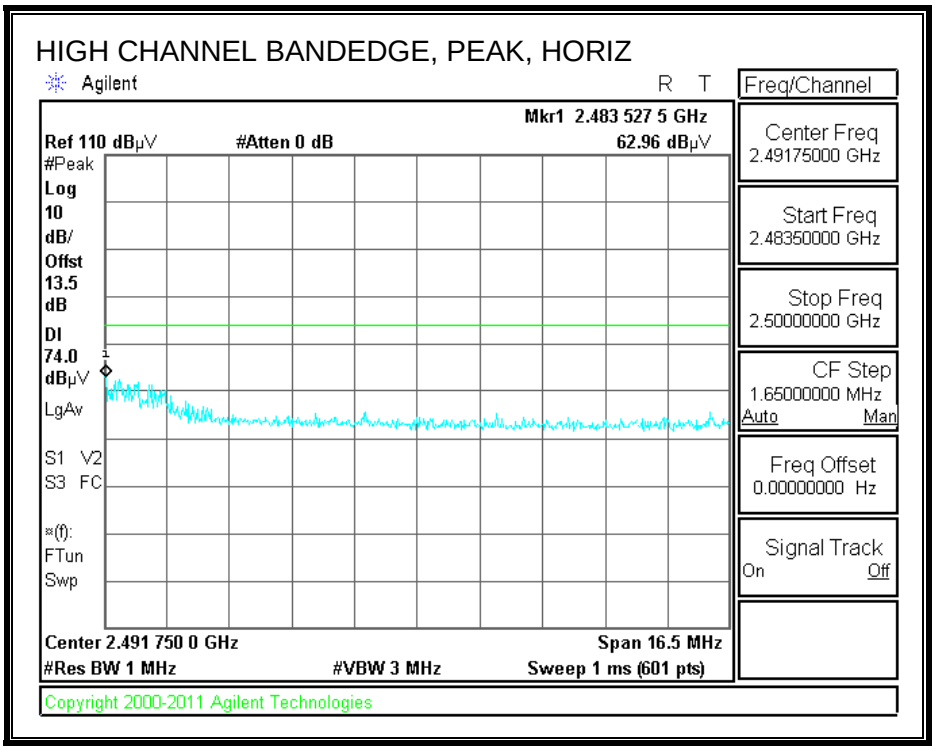
HIGH CHANNEL BANDEDGE, PEAK, VERT

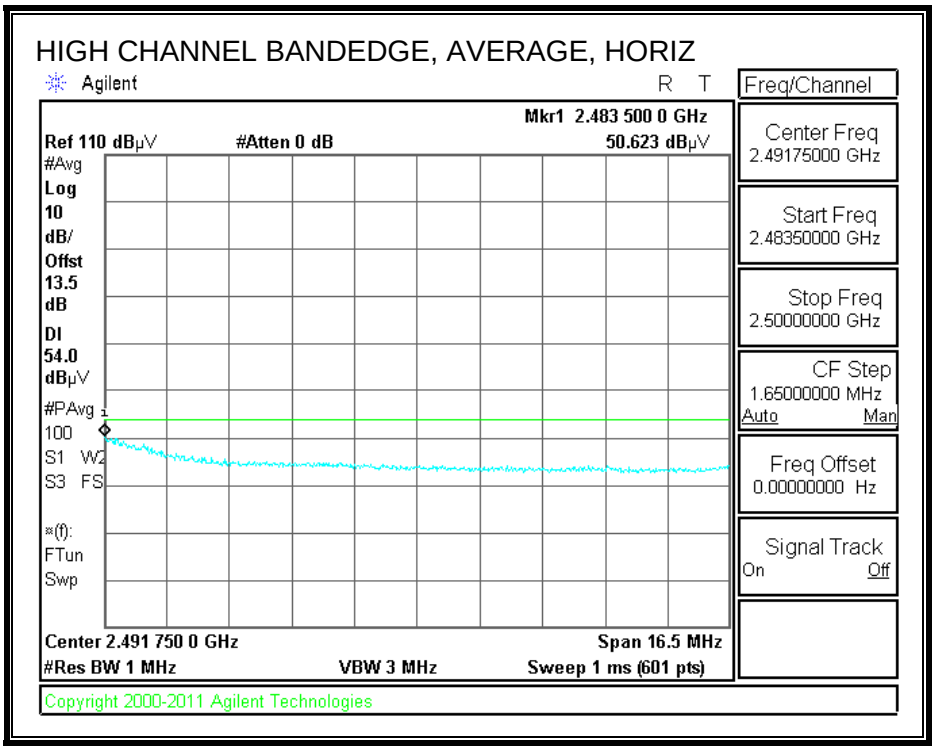


HIGH CHANNEL BANDEDGE, AVERAGE, VERT

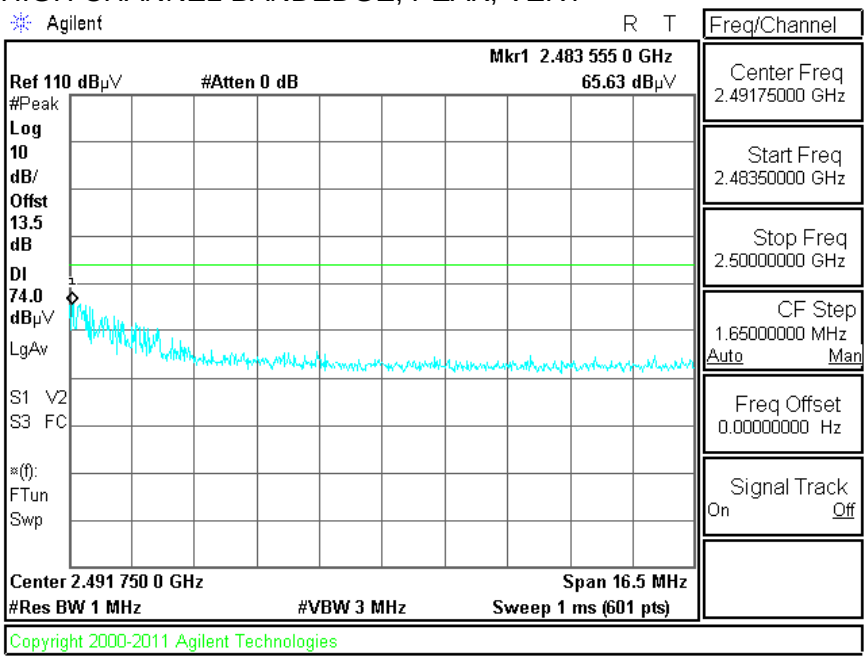


AUTHORIZED BANDEDGE (HIGH CHANNEL) CH11

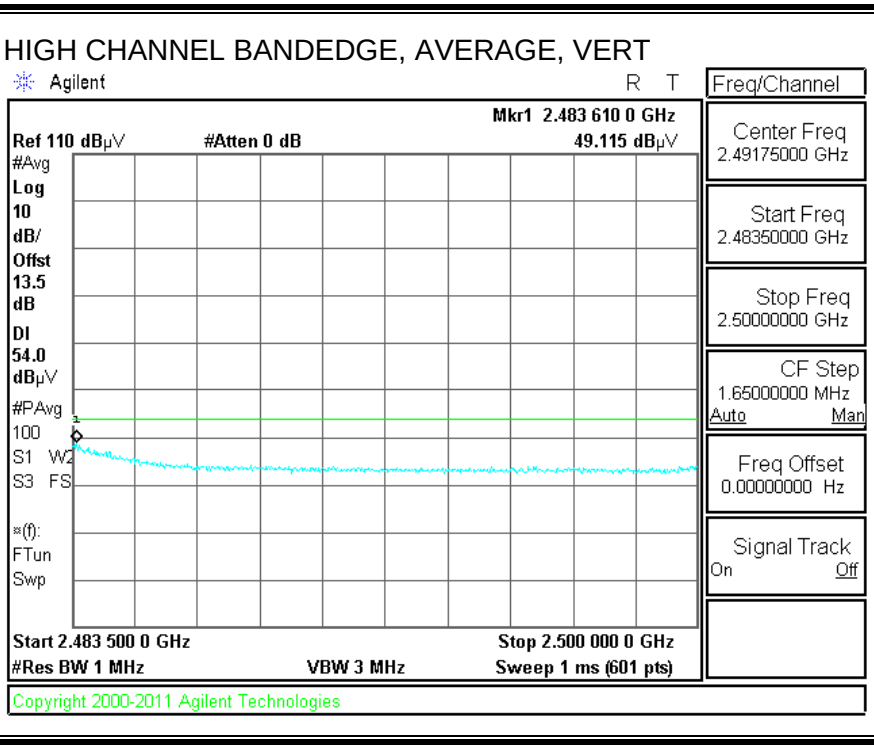




HIGH CHANNEL BANDEDGE, PEAK, VERT



HIGH CHANNEL BANDEDGE, AVERAGE, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 02/19/13
Project #: 12U14745
Company: Apple
Test Target: FCC Class B
Mode Oper: 11g SISO TX mode

f	Measurement Frequency	Amp	Preamp Gain
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m
AF	Antenna Factor	Peak	Calculated Peak Field Strength
CL	Cable Loss	HPF	High Pass Filter

Average Field Strength Limit
Peak Field Strength Limit
Margin vs. Average Limit
Margin vs. Peak Limit

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
2412MHz 11g SISO													
4.824	3.0	36.7	33.1	6.8	-34.1	0.0	0.0	42.5	74.0	-31.5	H	P	
4.824	3.0	25.5	33.1	6.8	-34.1	0.0	0.0	31.3	54.0	-22.7	H	A	
4.824	3.0	35.0	33.1	6.8	-34.1	0.0	0.0	40.8	74.0	-33.2	V	P	
4.824	3.0	25.7	33.1	6.8	-34.1	0.0	0.0	31.5	54.0	-22.5	V	A	
2437MHz 11g SISO													
4.874	3.0	35.4	33.2	6.8	-34.0	0.0	0.0	41.3	74.0	-32.7	H	P	
4.874	3.0	25.4	33.2	6.8	-34.0	0.0	0.0	31.4	54.0	-22.6	H	A	
4.874	3.0	35.2	33.2	6.8	-34.0	0.0	0.0	41.1	74.0	-32.9	V	P	
4.874	3.0	25.1	33.2	6.8	-34.0	0.0	0.0	31.0	54.0	-23.0	V	A	
2462MHz 11g SISO													
4.924	3.0	35.8	33.2	6.8	-34.0	0.0	0.0	41.8	74.0	-32.2	V	P	
4.924	3.0	22.7	33.2	6.8	-34.0	0.0	0.0	28.7	54.0	-25.3	V	A	
4.924	3.0	36.1	33.2	6.8	-34.0	0.0	0.0	42.1	74.0	-31.9	H	P	
4.924	3.0	25.1	33.2	6.8	-34.0	0.0	0.0	31.1	54.0	-22.9	H	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

9.6. TX ABOVE 1 GHz 802.11g 2TX MODE IN THE 2.4 GHz BAND

Covered by testing 11n HT20 CDD MCS0 3TX, total power across all three chains is higher than the power level the device will operate at.

9.7. TX ABOVE 1 GHz 802.11g 3TX MODE IN THE 2.4 GHz BAND

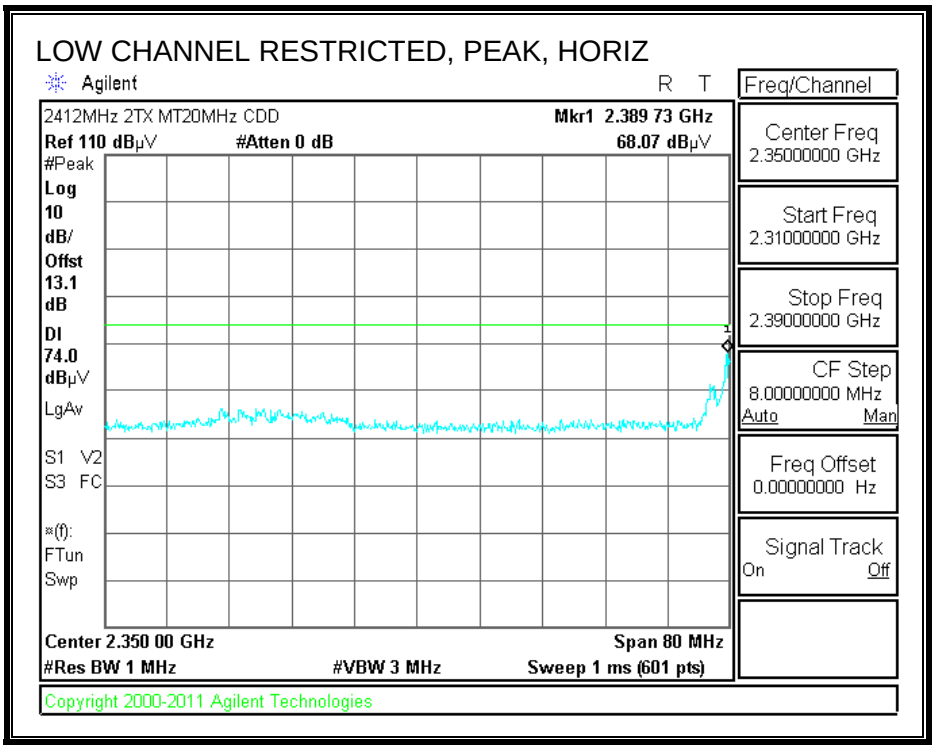
Covered by testing 11n HT20 CCD MCS0 3TX, total power across all three chains is higher than the power level the device will operate at.

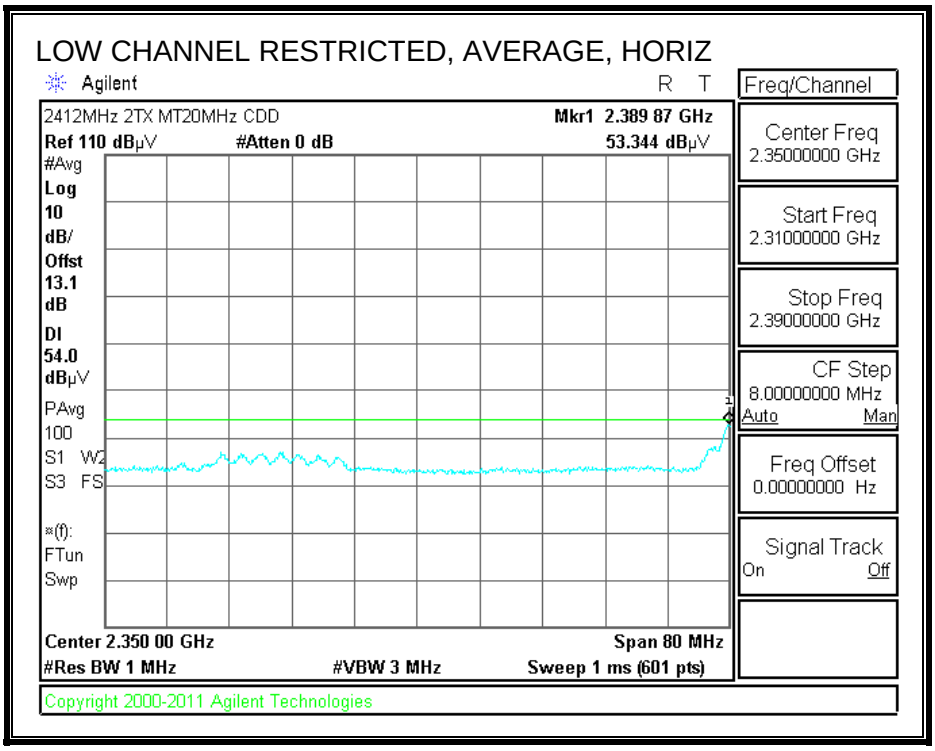
9.8. TX ABOVE 1 GHz 802.11n HT20 1TX MODE IN THE 2.4 GHz BAND

Covered by testing 11n HT20 CDD MCS0 3TX, total power across all three chains is higher than the power level the device will operate at.

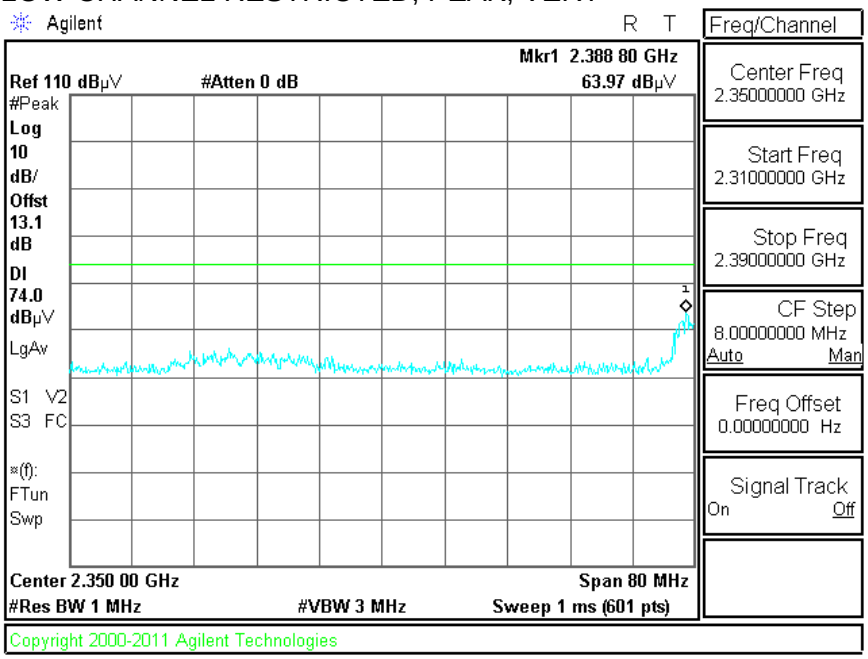
9.9. TX ABOVE 1 GHz 802.11n HT20 2TX MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL) CH1

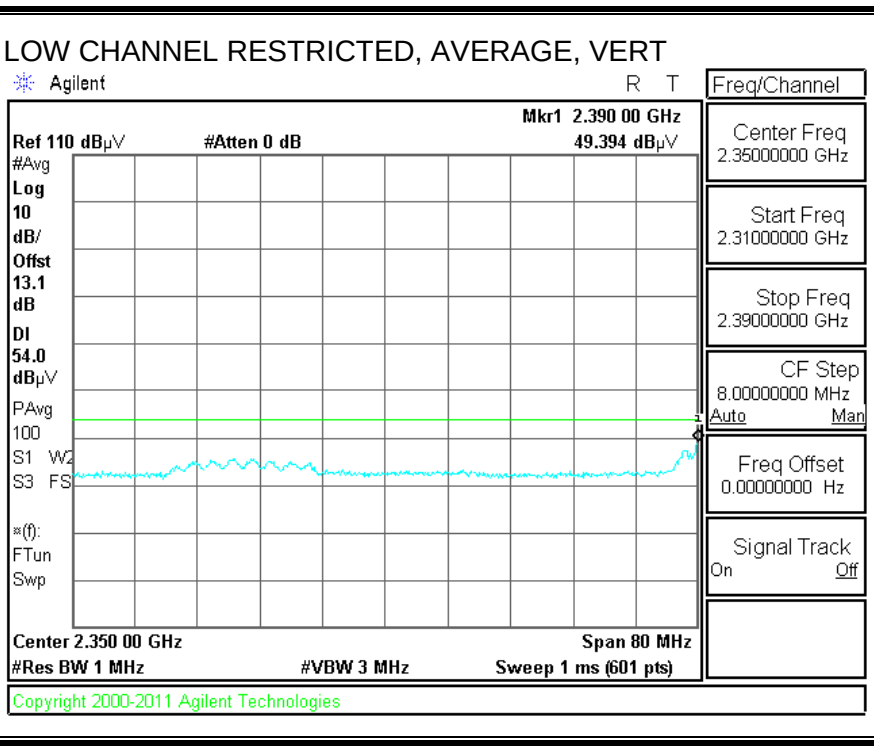




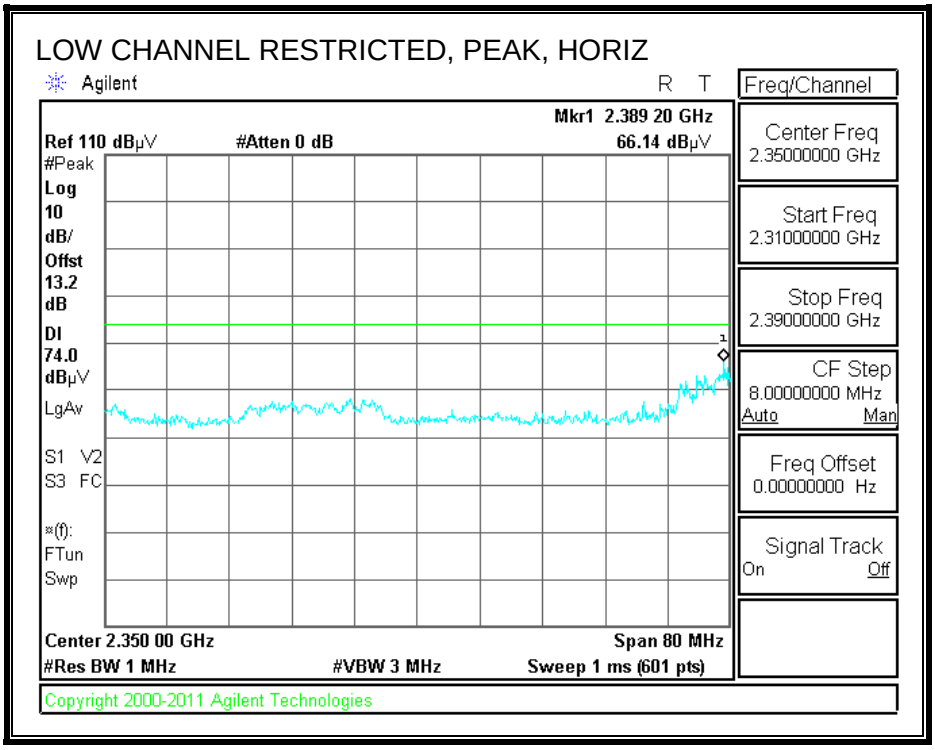
LOW CHANNEL RESTRICTED, PEAK, VERT

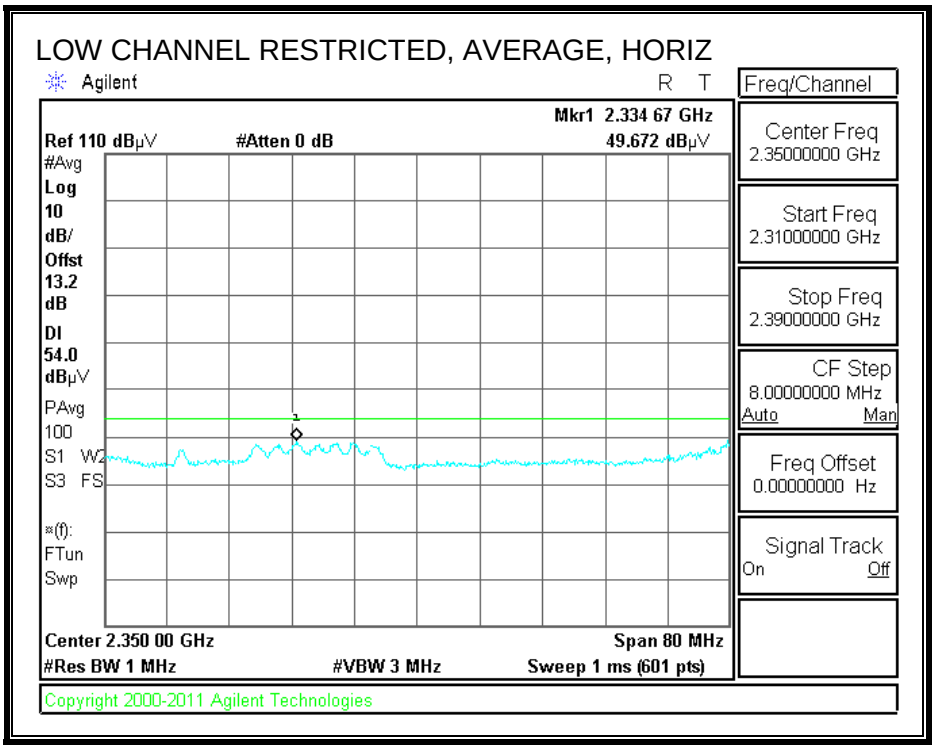


LOW CHANNEL RESTRICTED, AVERAGE, VERT

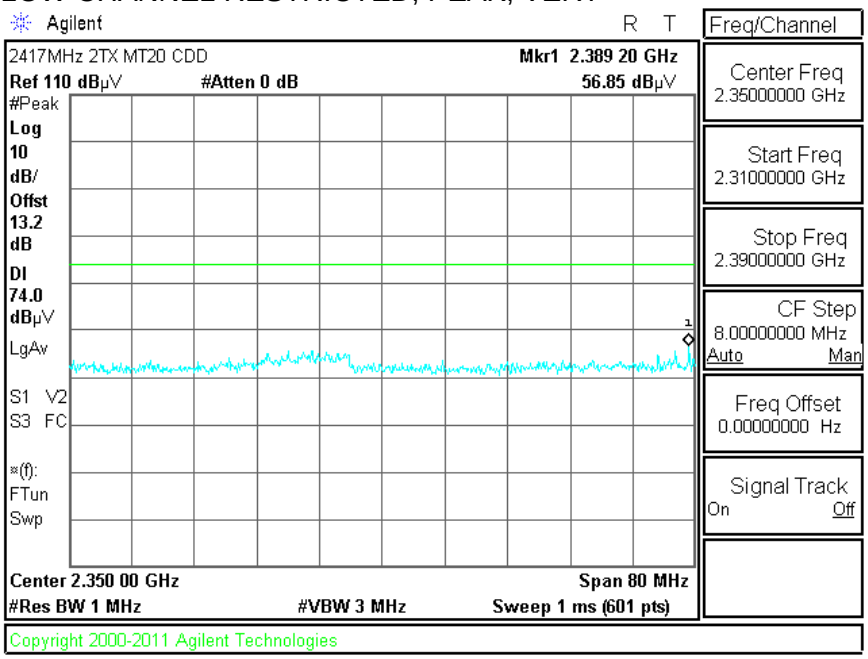


RESTRICTED BANDEDGE (LOW CHANNEL) CH2

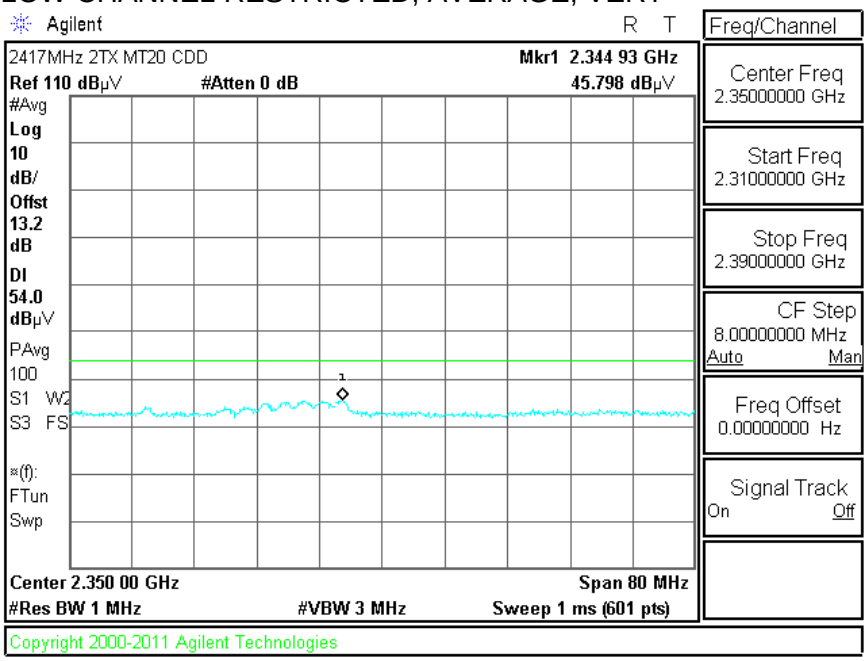




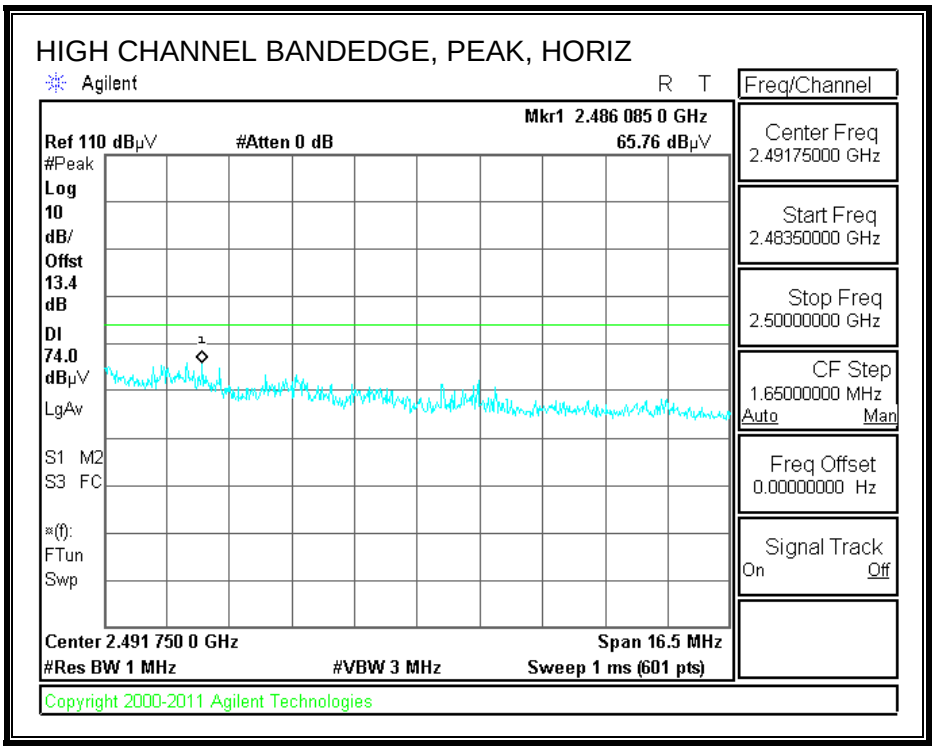
LOW CHANNEL RESTRICTED, PEAK, VERT

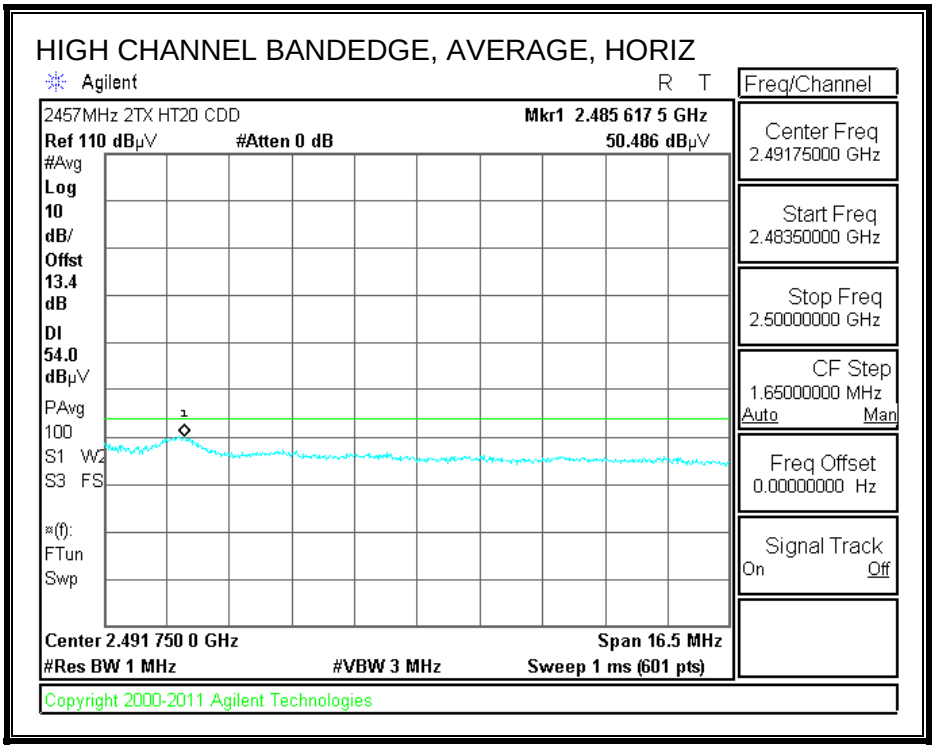


LOW CHANNEL RESTRICTED, AVERAGE, VERT

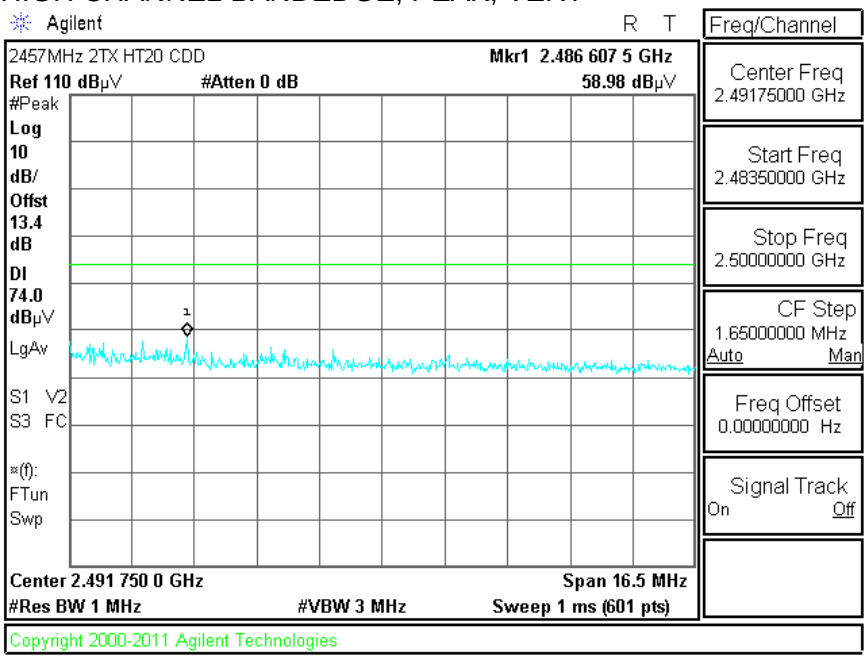


AUTHORIZED BANDEDGE (HIGH CHANNEL) CH10

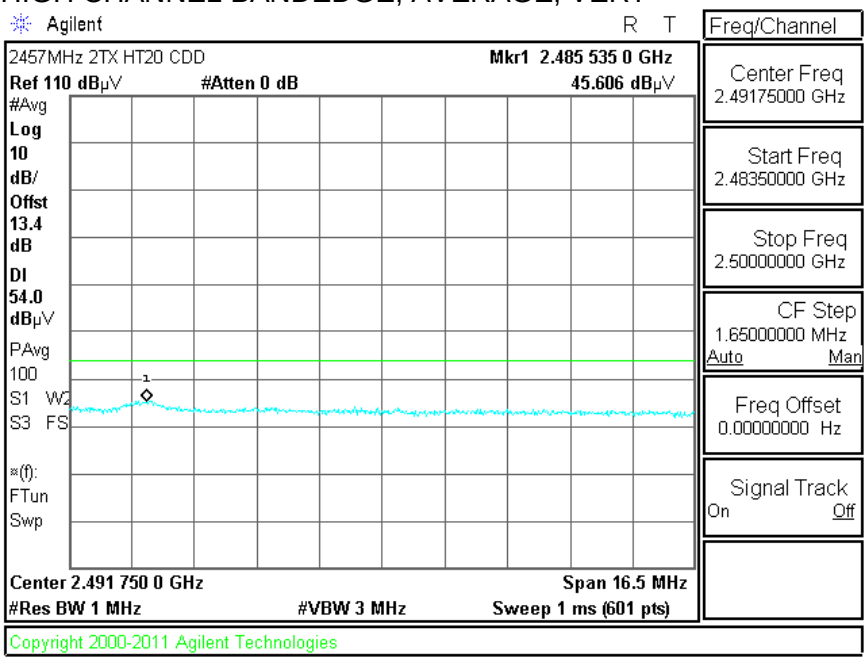




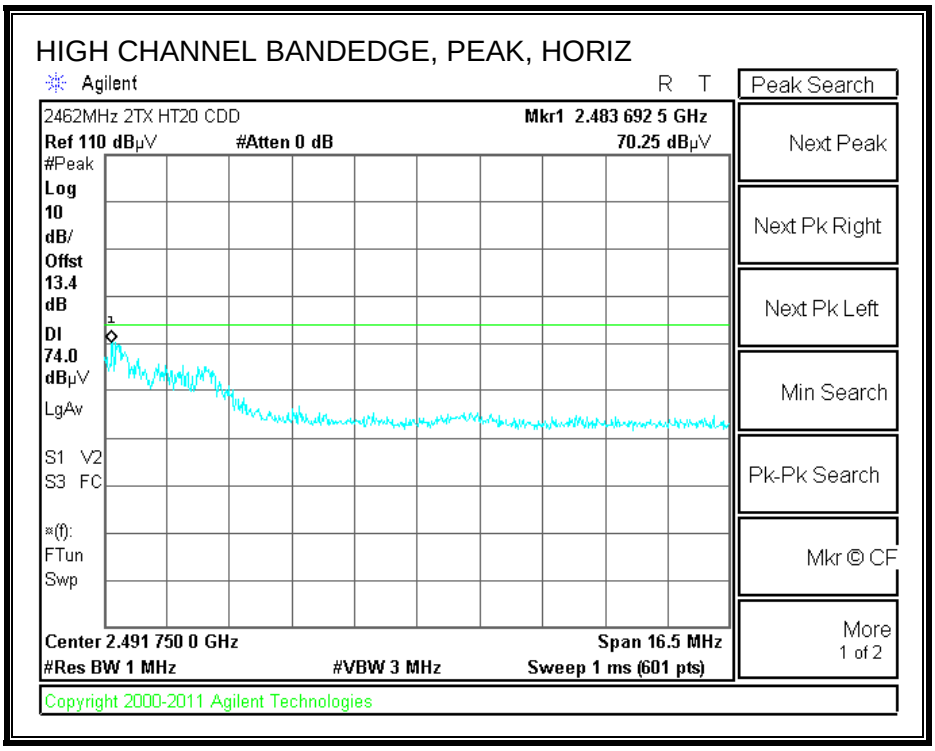
HIGH CHANNEL BANDEDGE, PEAK, VERT

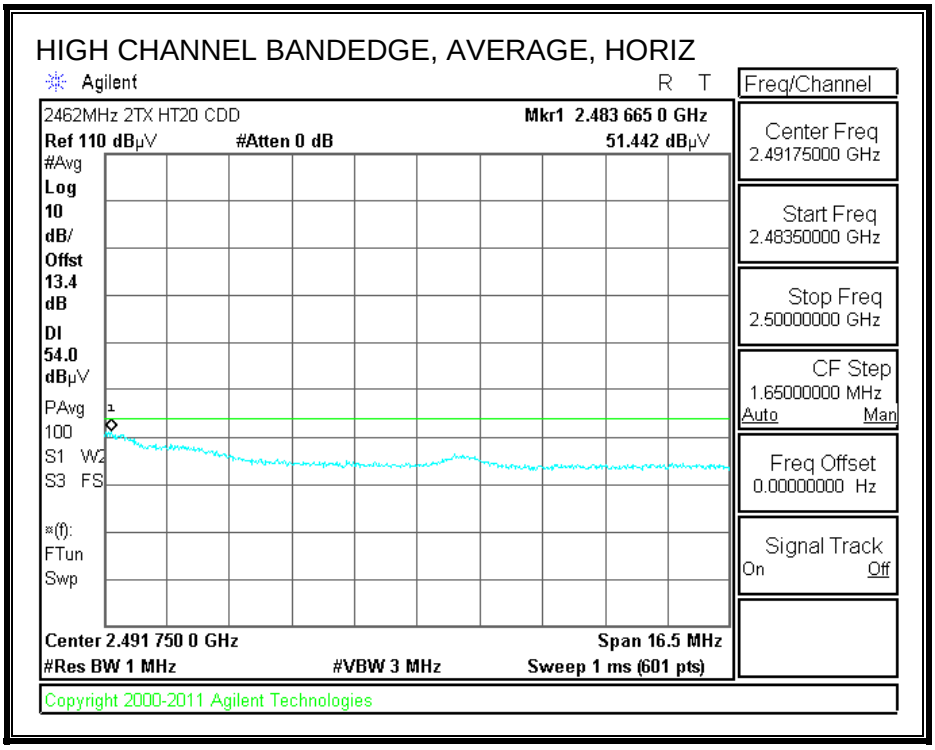


HIGH CHANNEL BANDEDGE, AVERAGE, VERT

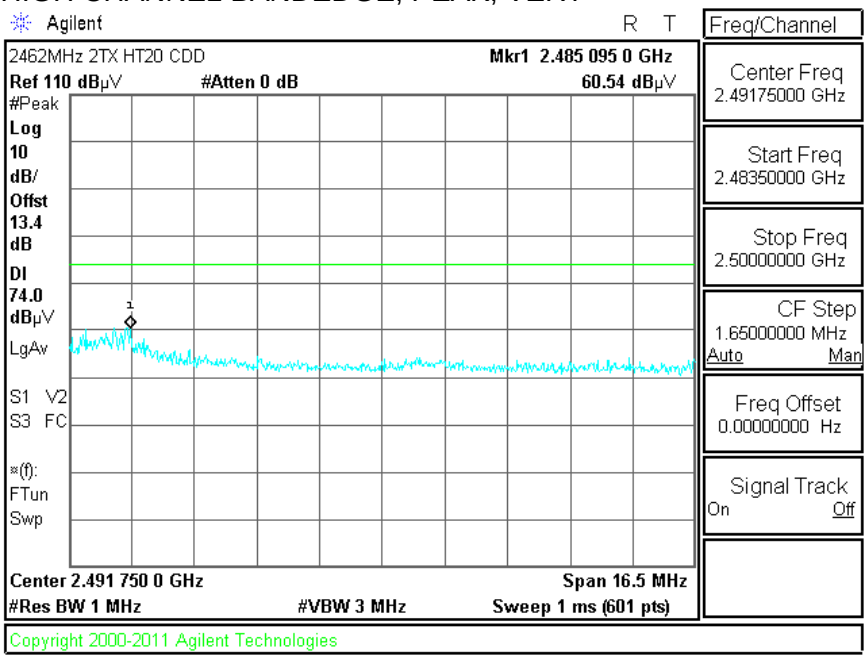


AUTHORIZED BANDEDGE (HIGH CHANNEL) CH11

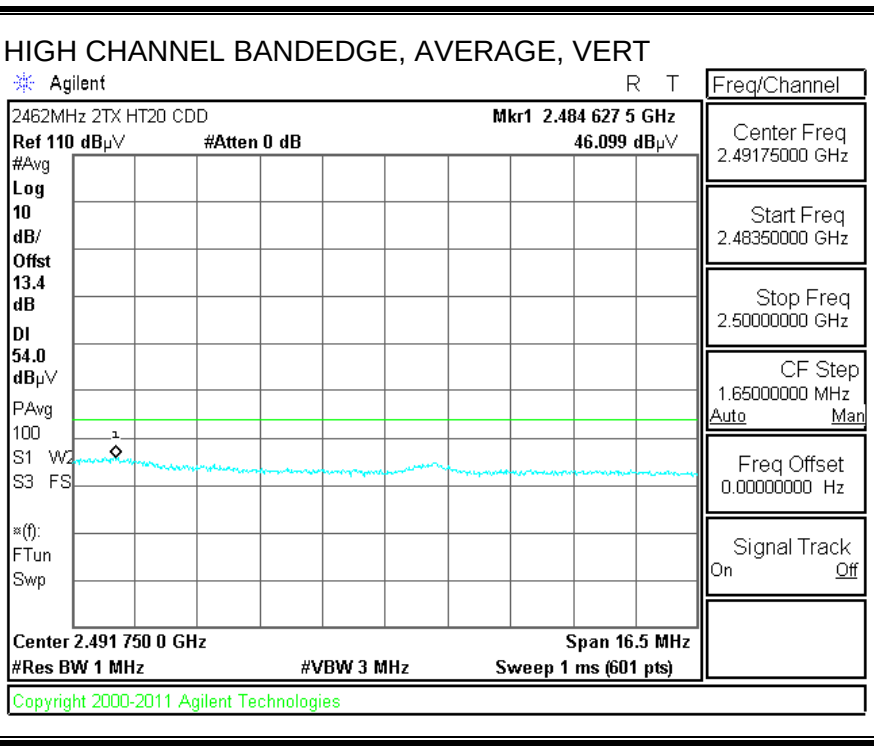




HIGH CHANNEL BANDEDGE, PEAK, VERT



HIGH CHANNEL BANDEDGE, AVERAGE, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Oliver Su
Date: 02/18/13
Project #: 12U14745
Company: Apple
Test Target:
Mode Oper: 11n 3Tx HT20 Power= 23 dBm per each chain

f	Measurement Frequency	Amp	Preamp Gain
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m
AF	Antenna Factor	Peak	Calculated Peak Field Strength
CL	Cable Loss	HPF	High Pass Filter

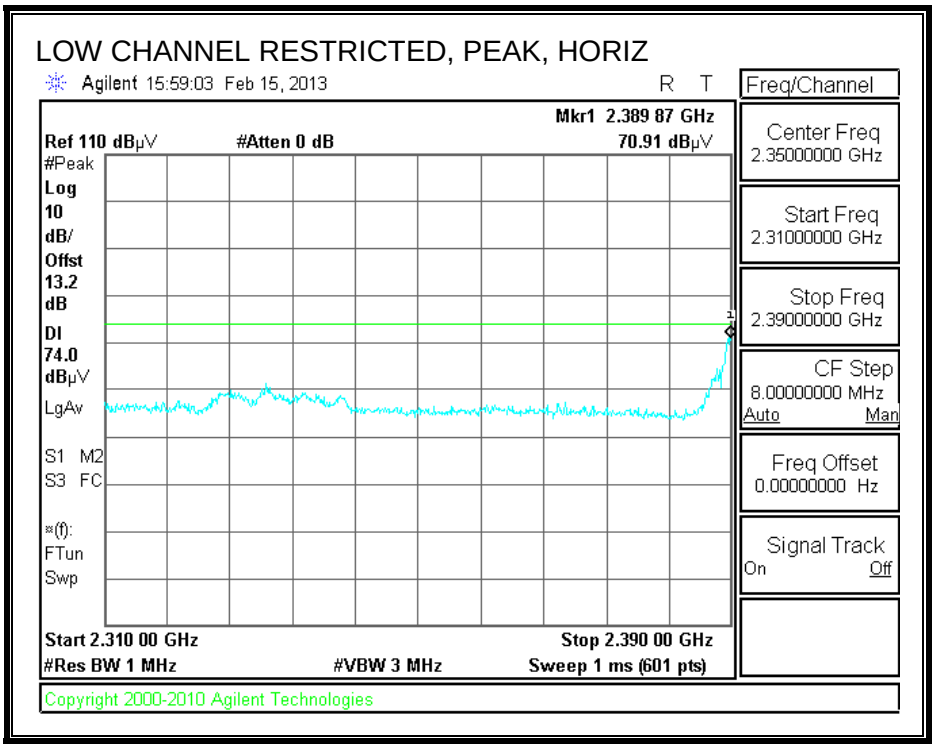
Average Field Strength Limit
Peak Field Strength Limit
Margin vs. Average Limit
Margin vs. Peak Limit

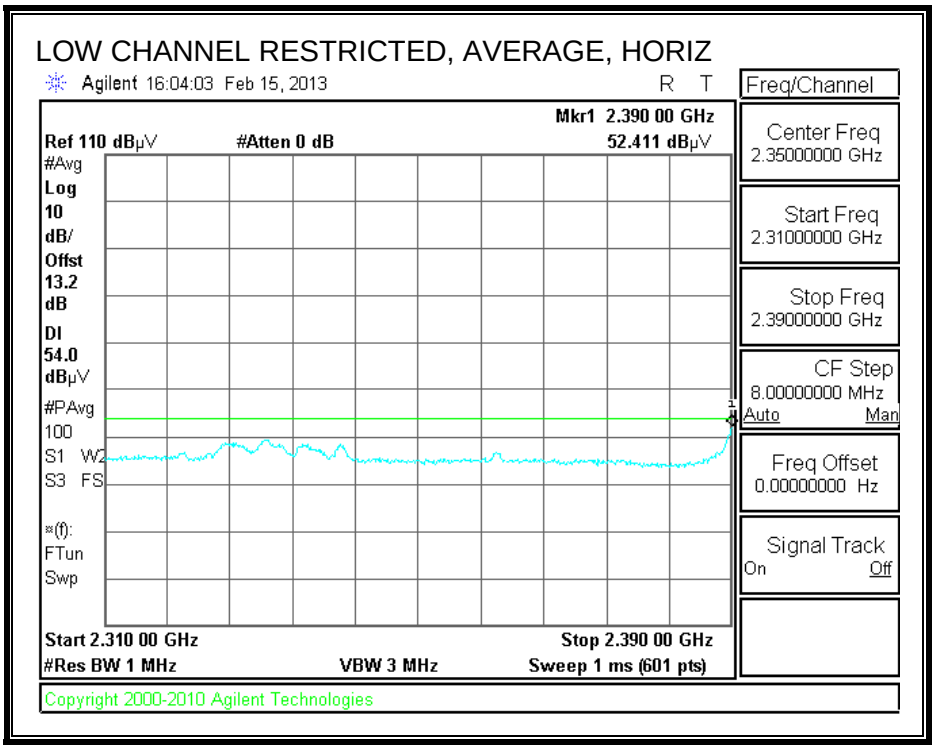
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch_2412MHz													
4.824	3.0	40.3	33.1	6.8	-34.1	0.0	0.0	46.1	74.0	-27.9	H	P	
4.824	3.0	26.7	33.1	6.8	-34.1	0.0	0.0	32.5	54.0	-21.5	H	A	
12.060	3.0	33.3	39.4	11.9	-32.5	0.0	0.0	52.1	74.0	-21.9	H	P	
12.060	3.0	22.9	39.4	11.9	-32.5	0.0	0.0	41.7	54.0	-12.3	H	A	
4.824	3.0	36.1	33.1	6.8	-34.1	0.0	0.0	41.9	74.0	-32.1	V	P	
4.824	3.0	25.4	33.1	6.8	-34.1	0.0	0.0	31.2	54.0	-22.8	V	A	
12.060	3.0	33.7	39.4	11.9	-32.5	0.0	0.0	52.5	74.0	-21.5	V	P	
12.060	3.0	23.0	39.4	11.9	-32.5	0.0	0.0	41.8	54.0	-12.2	V	A	
Mid Ch_2437MHz													
4.874	3.0	38.7	33.1	6.8	-34.0	0.0	0.0	44.6	74.0	-29.4	H	P	
4.874	3.0	26.3	33.1	6.8	-34.0	0.0	0.0	32.2	54.0	-21.8	H	A	
7.311	3.0	34.9	35.8	9.1	-33.1	0.0	0.0	46.7	74.0	-27.3	H	P	
7.311	3.0	27.5	35.8	9.1	-33.1	0.0	0.0	39.3	54.0	-14.7	H	A	
4.874	3.0	35.5	33.1	6.8	-34.0	0.0	0.0	41.4	74.0	-32.6	V	P	
4.874	3.0	25.0	33.1	6.8	-34.0	0.0	0.0	30.9	54.0	-23.1	V	A	
7.311	3.0	35.1	35.8	9.1	-33.1	0.0	0.0	46.9	74.0	-27.1	V	P	
7.311	3.0	23.7	35.8	9.1	-33.1	0.0	0.0	35.5	54.0	-18.5	V	A	
High Ch_2462MHz													
4.924	3.0	36.2	33.2	6.8	-34.0	0.0	0.0	42.2	74.0	-31.8	H	P	
4.924	3.0	26.1	33.2	6.8	-34.0	0.0	0.0	32.1	54.0	-21.9	H	A	
7.386	3.0	36.1	35.9	9.1	-33.1	0.0	0.0	48.1	74.0	-25.9	H	P	
7.386	3.0	28.8	35.9	9.1	-33.1	0.0	0.0	40.8	54.0	-13.2	H	A	
4.924	3.0	35.7	33.2	6.8	-34.0	0.0	0.0	41.7	74.0	-32.3	V	P	
4.924	3.0	25.3	33.2	6.8	-34.0	0.0	0.0	31.3	54.0	-22.7	V	A	
7.386	3.0	34.5	35.9	9.1	-33.1	0.0	0.0	46.5	74.0	-27.5	V	P	
7.386	3.0	24.0	35.9	9.1	-33.1	0.0	0.0	36.0	54.0	-18.0	V	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

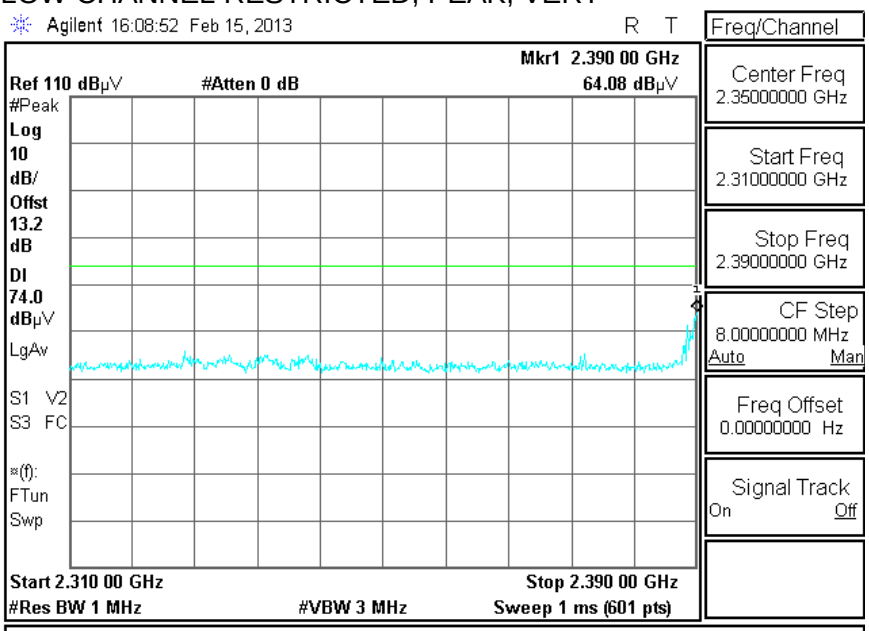
9.10. TX ABOVE 1 GHz 802.11n HT20 CDD 3TX MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL) CH1

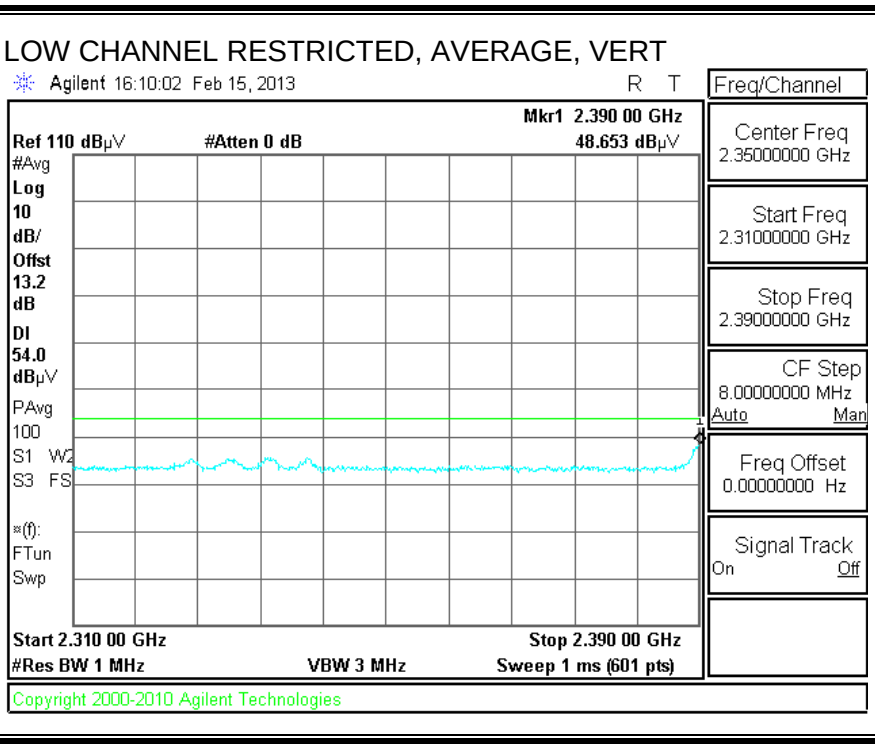




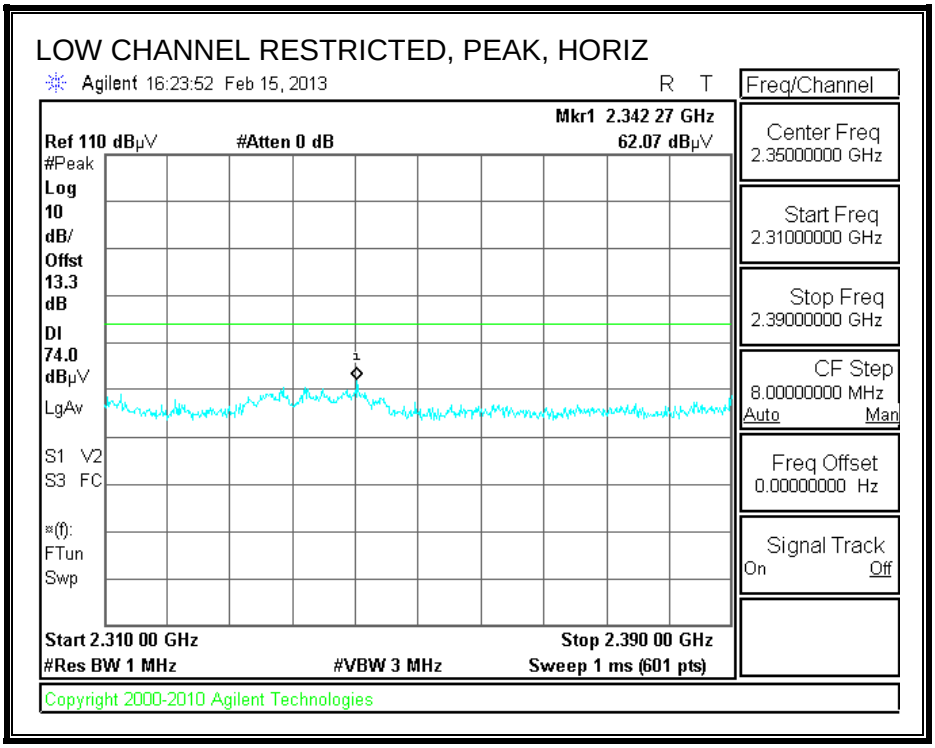
LOW CHANNEL RESTRICTED, PEAK, VERT

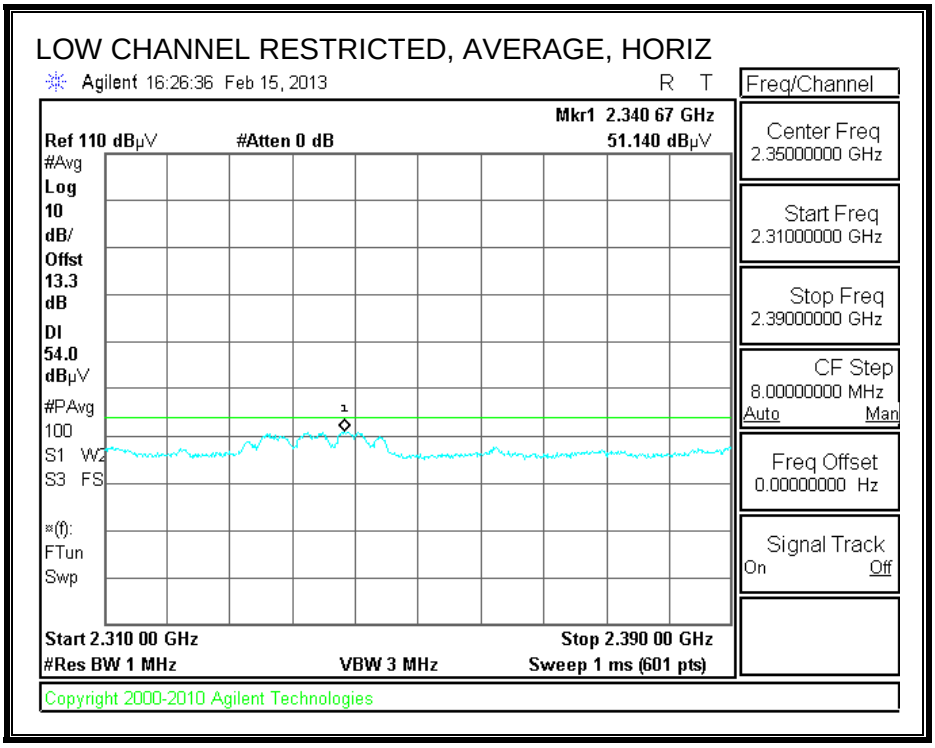


LOW CHANNEL RESTRICTED, AVERAGE, VERT

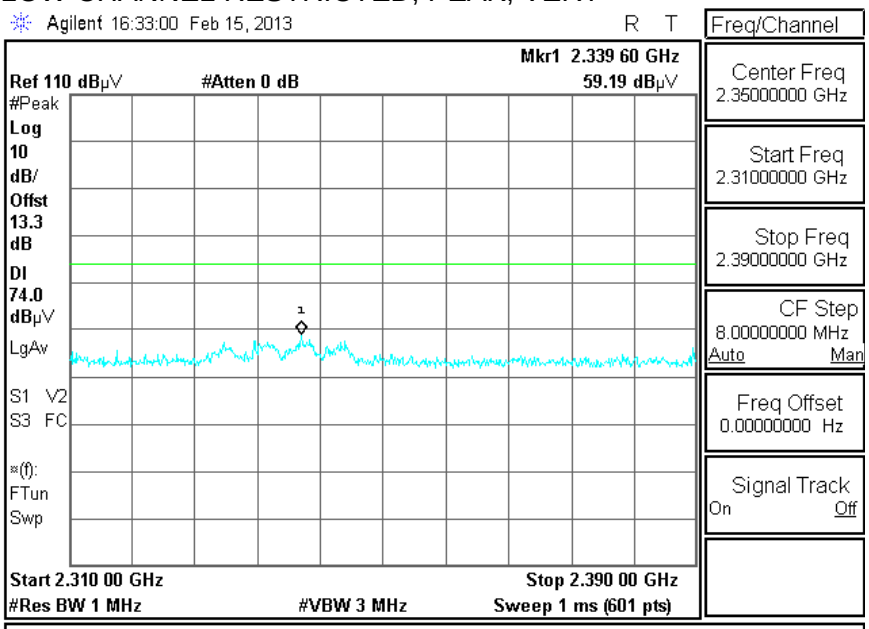


RESTRICTED BANDEDGE (LOW CHANNEL) CH2

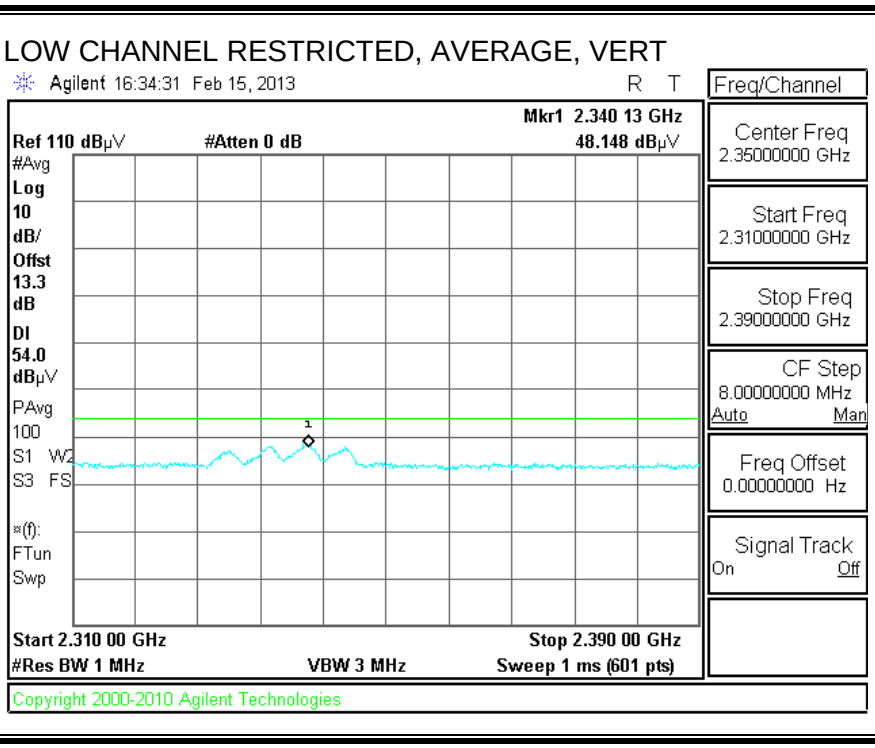




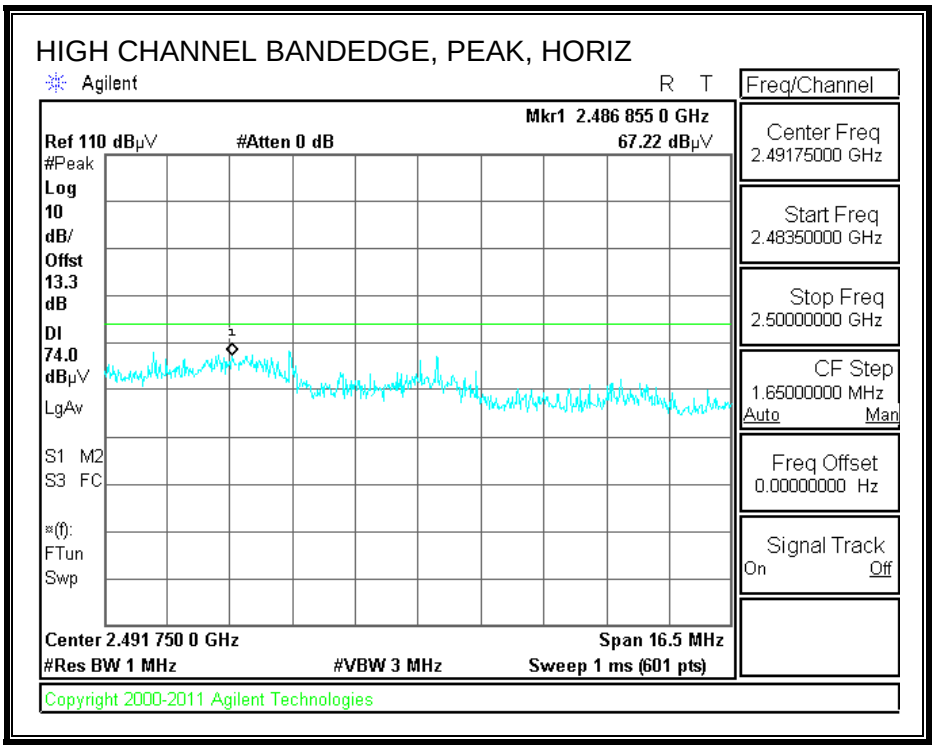
LOW CHANNEL RESTRICTED, PEAK, VERT

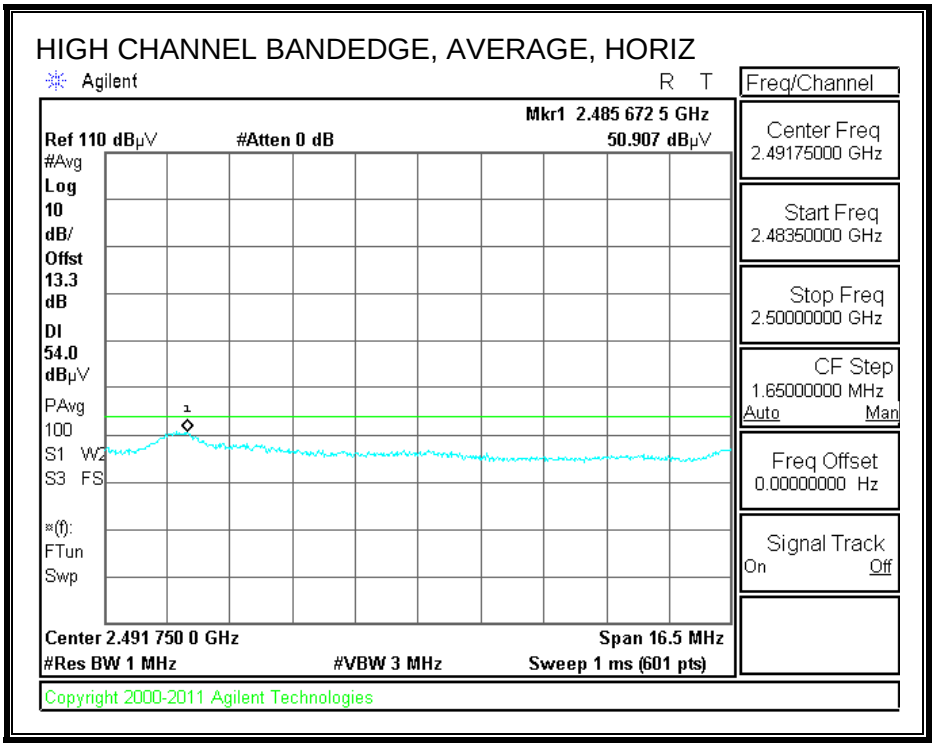


LOW CHANNEL RESTRICTED, AVERAGE, VERT

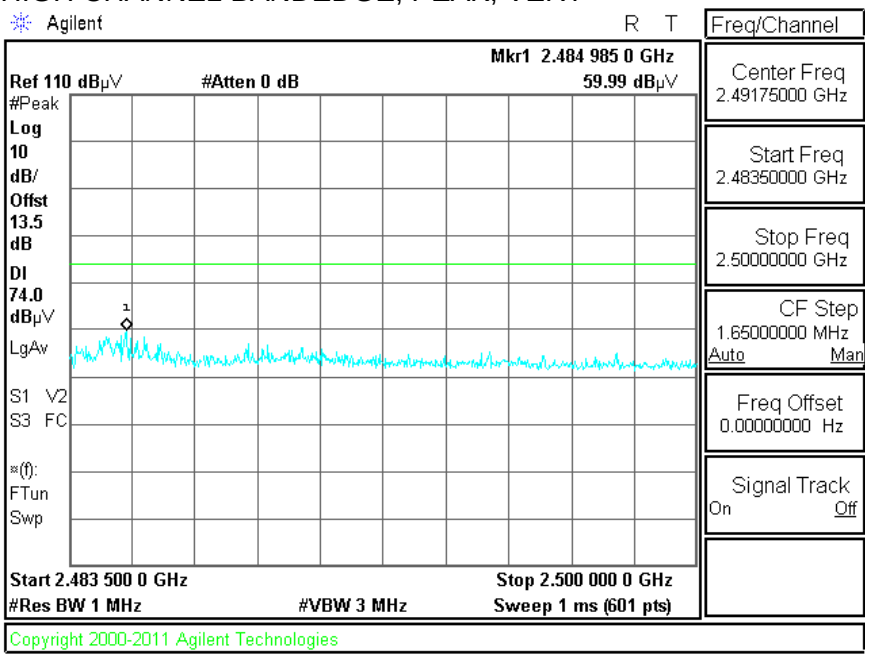


AUTHORIZED BANDEDGE (HIGH CHANNEL) CH10

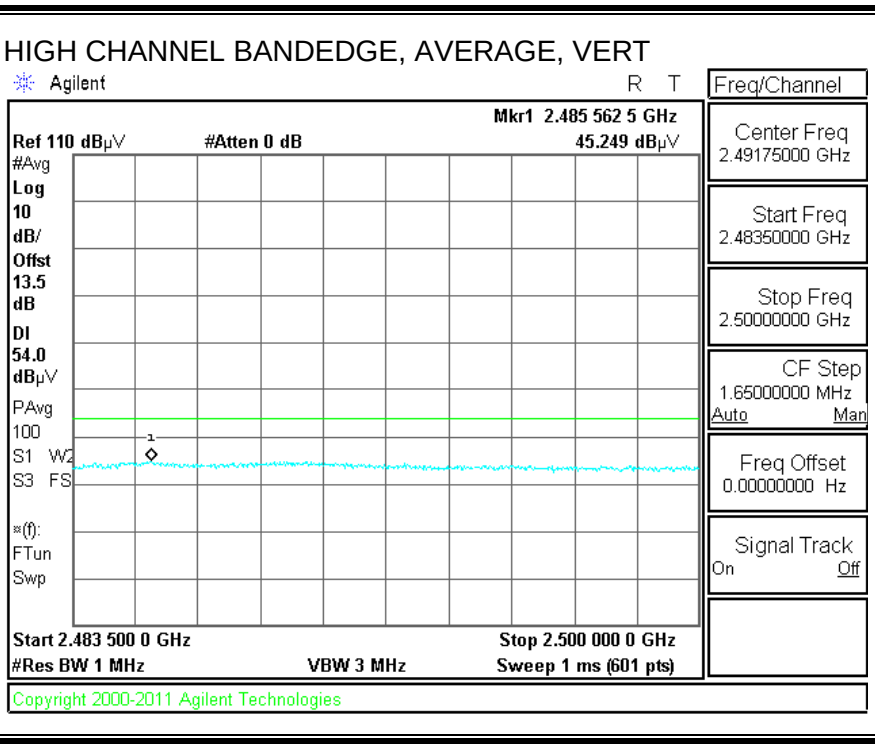




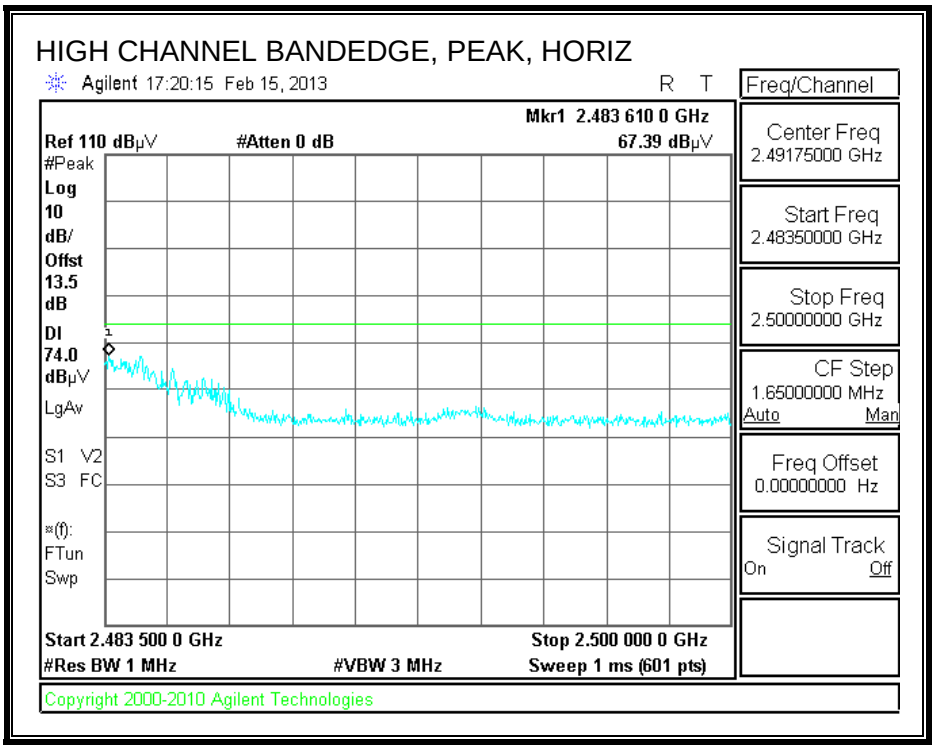
HIGH CHANNEL BANDEDGE, PEAK, VERT

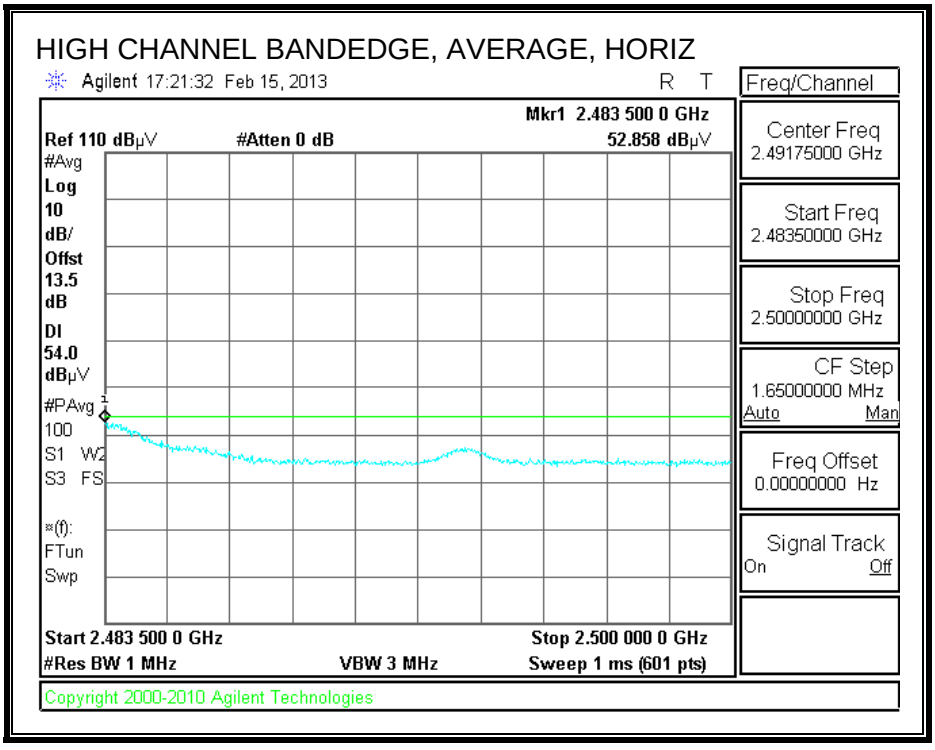


HIGH CHANNEL BANDEDGE, AVERAGE, VERT

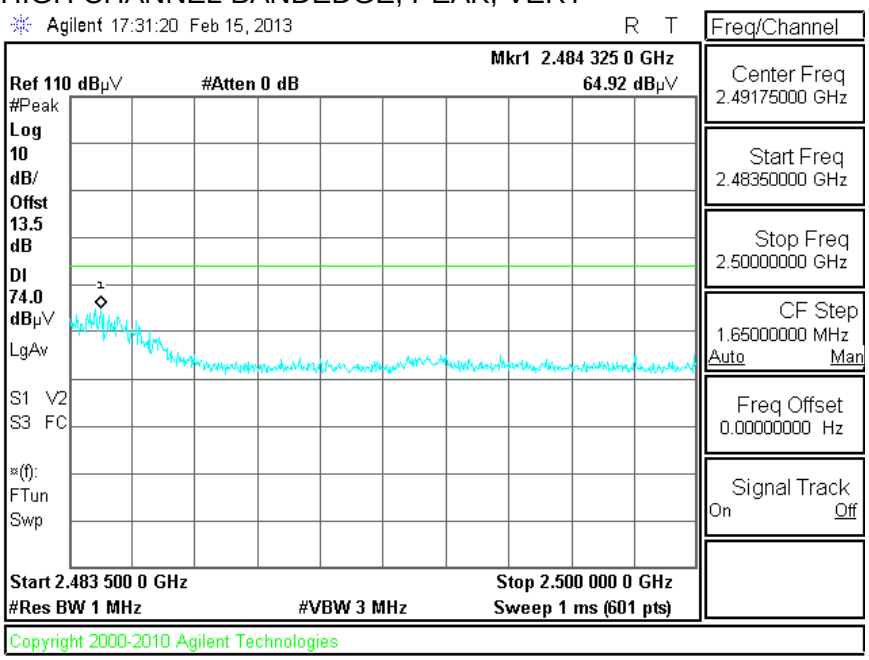


AUTHORIZED BANDEDGE (HIGH CHANNEL) CH11

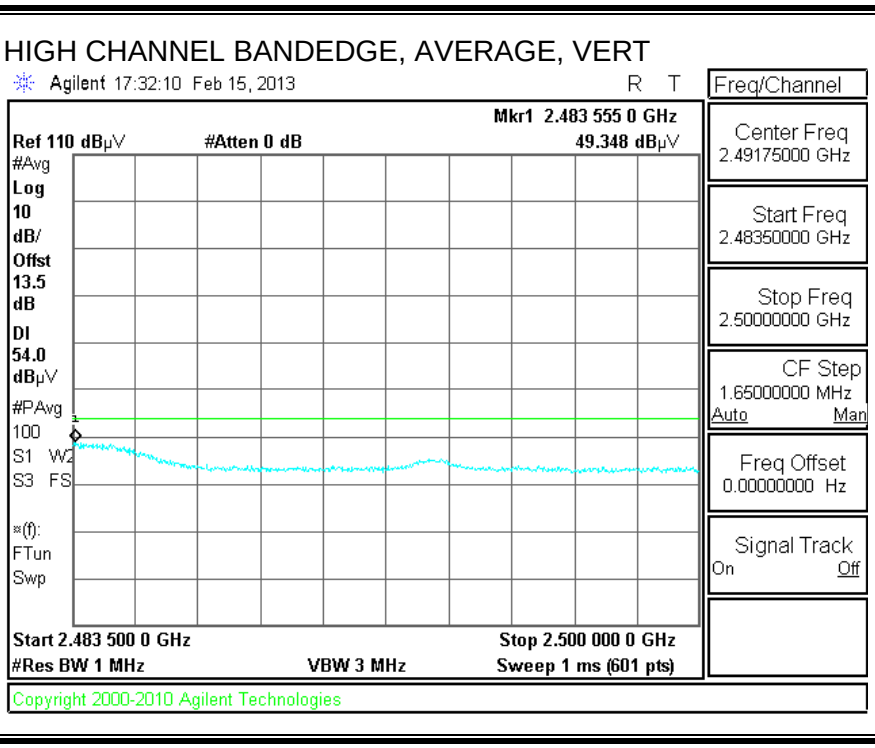




HIGH CHANNEL BANDEDGE, PEAK, VERT



HIGH CHANNEL BANDEDGE, AVERAGE, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Oliver Su
Date: 02/18/13
Project #: 12U14745
Company: Apple
Test Target:
Mode Oper: 11n 3Tx HT20 Power= 23 dBm per each chain

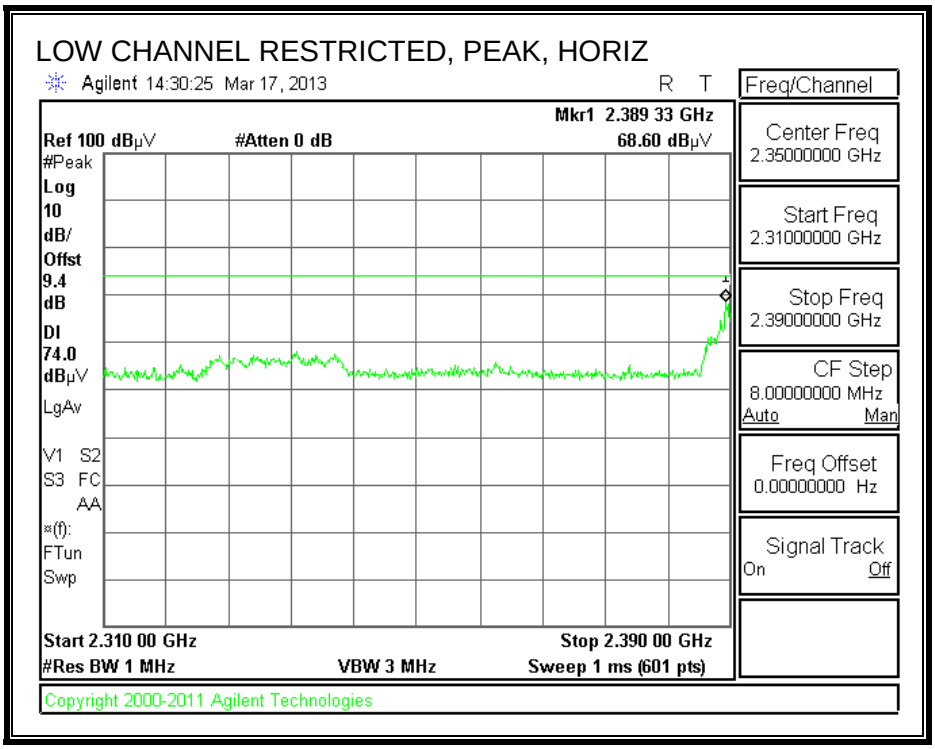
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

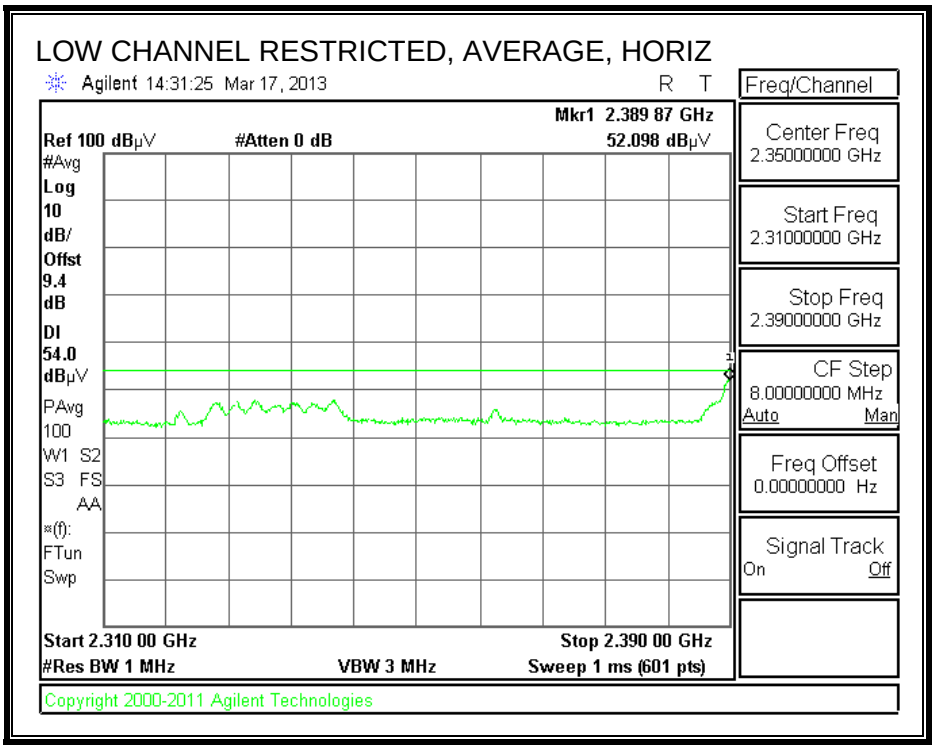
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch_2412MHz													
4.824	3.0	40.3	33.1	6.8	-34.1	0.0	0.0	46.1	74.0	-27.9	H	P	
4.824	3.0	26.7	33.1	6.8	-34.1	0.0	0.0	32.5	54.0	-21.5	H	A	
12.060	3.0	33.3	39.4	11.9	-32.5	0.0	0.0	52.1	74.0	-21.9	H	P	
12.060	3.0	22.9	39.4	11.9	-32.5	0.0	0.0	41.7	54.0	-12.3	H	A	
4.824	3.0	36.1	33.1	6.8	-34.1	0.0	0.0	41.9	74.0	-32.1	V	P	
4.824	3.0	25.4	33.1	6.8	-34.1	0.0	0.0	31.2	54.0	-22.8	V	A	
12.060	3.0	33.7	39.4	11.9	-32.5	0.0	0.0	52.5	74.0	-21.5	V	P	
12.060	3.0	23.0	39.4	11.9	-32.5	0.0	0.0	41.8	54.0	-12.2	V	A	
Mid Ch_2437MHz													
4.874	3.0	38.7	33.1	6.8	-34.0	0.0	0.0	44.6	74.0	-29.4	H	P	
4.874	3.0	26.3	33.1	6.8	-34.0	0.0	0.0	32.2	54.0	-21.8	H	A	
7.311	3.0	34.9	35.8	9.1	-33.1	0.0	0.0	46.7	74.0	-27.3	H	P	
7.311	3.0	27.5	35.8	9.1	-33.1	0.0	0.0	39.3	54.0	-14.7	H	A	
4.874	3.0	35.5	33.1	6.8	-34.0	0.0	0.0	41.4	74.0	-32.6	V	P	
4.874	3.0	25.0	33.1	6.8	-34.0	0.0	0.0	30.9	54.0	-23.1	V	A	
7.311	3.0	35.1	35.8	9.1	-33.1	0.0	0.0	46.9	74.0	-27.1	V	P	
7.311	3.0	23.7	35.8	9.1	-33.1	0.0	0.0	35.5	54.0	-18.5	V	A	
High Ch_2462MHz													
4.924	3.0	36.2	33.2	6.8	-34.0	0.0	0.0	42.2	74.0	-31.8	H	P	
4.924	3.0	26.1	33.2	6.8	-34.0	0.0	0.0	32.1	54.0	-21.9	H	A	
7.386	3.0	36.1	35.9	9.1	-33.1	0.0	0.0	48.1	74.0	-25.9	H	P	
7.386	3.0	28.8	35.9	9.1	-33.1	0.0	0.0	40.8	54.0	-13.2	H	A	
4.924	3.0	35.7	33.2	6.8	-34.0	0.0	0.0	41.7	74.0	-32.3	V	P	
4.924	3.0	25.3	33.2	6.8	-34.0	0.0	0.0	31.3	54.0	-22.7	V	A	
7.386	3.0	34.5	35.9	9.1	-33.1	0.0	0.0	46.5	74.0	-27.5	V	P	
7.386	3.0	24.0	35.9	9.1	-33.1	0.0	0.0	36.0	54.0	-18.0	V	A	

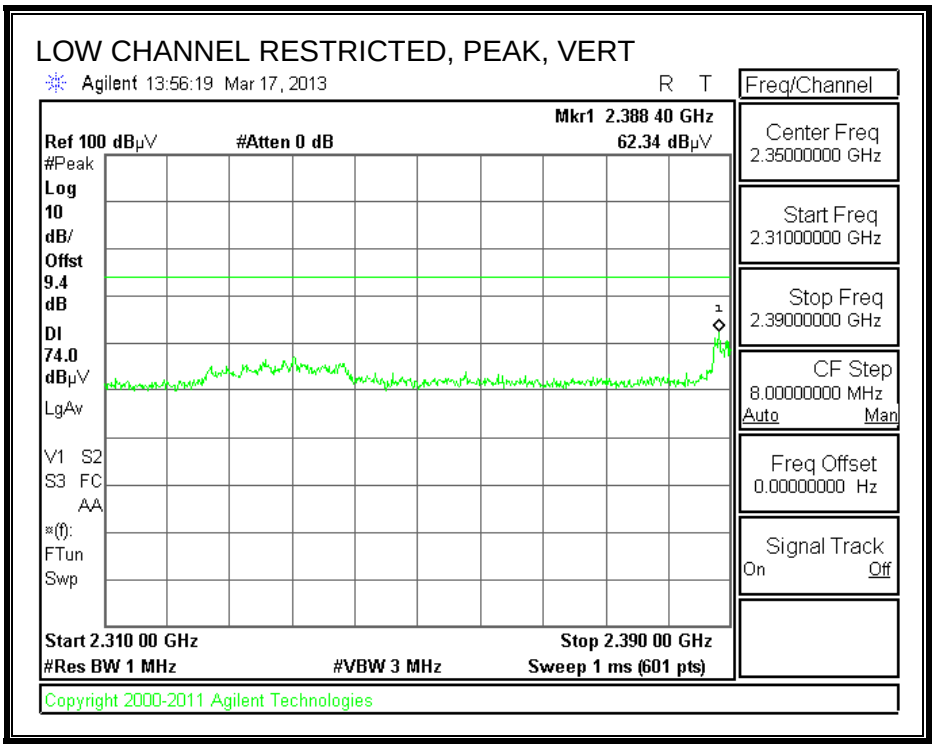
Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

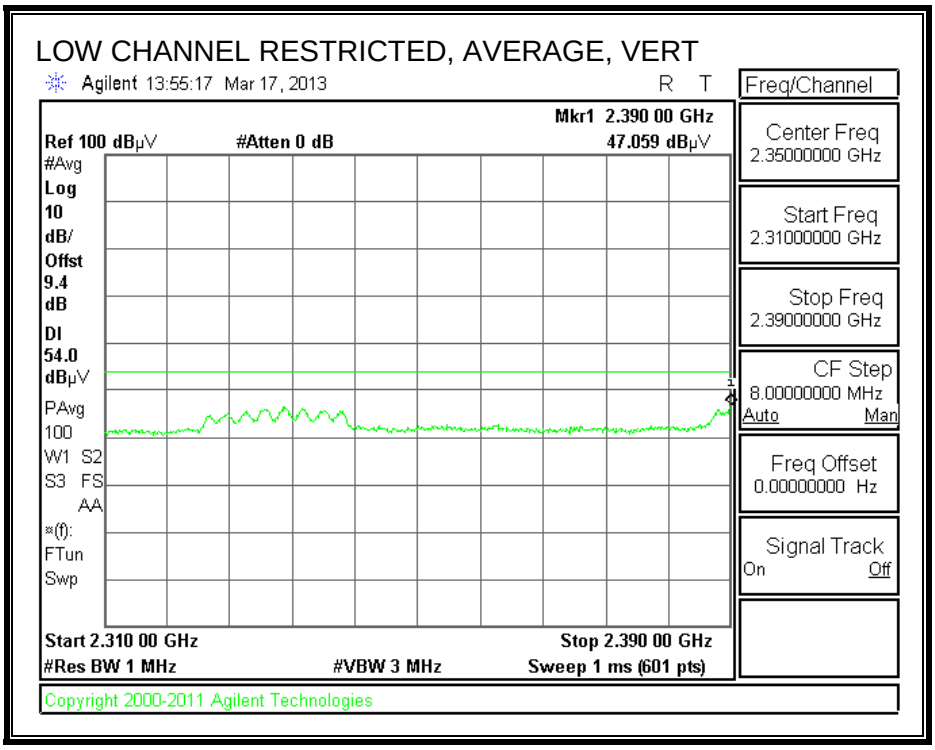
9.11. TX ABOVE 1 GHz 802.11n HT20 BF 2TX MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL) CH1

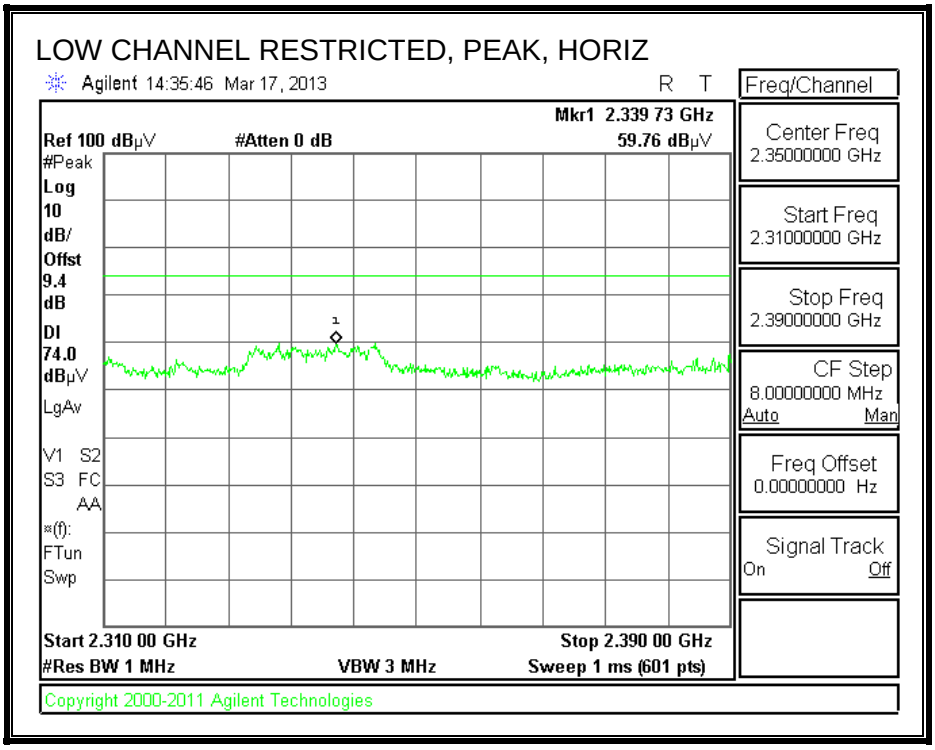


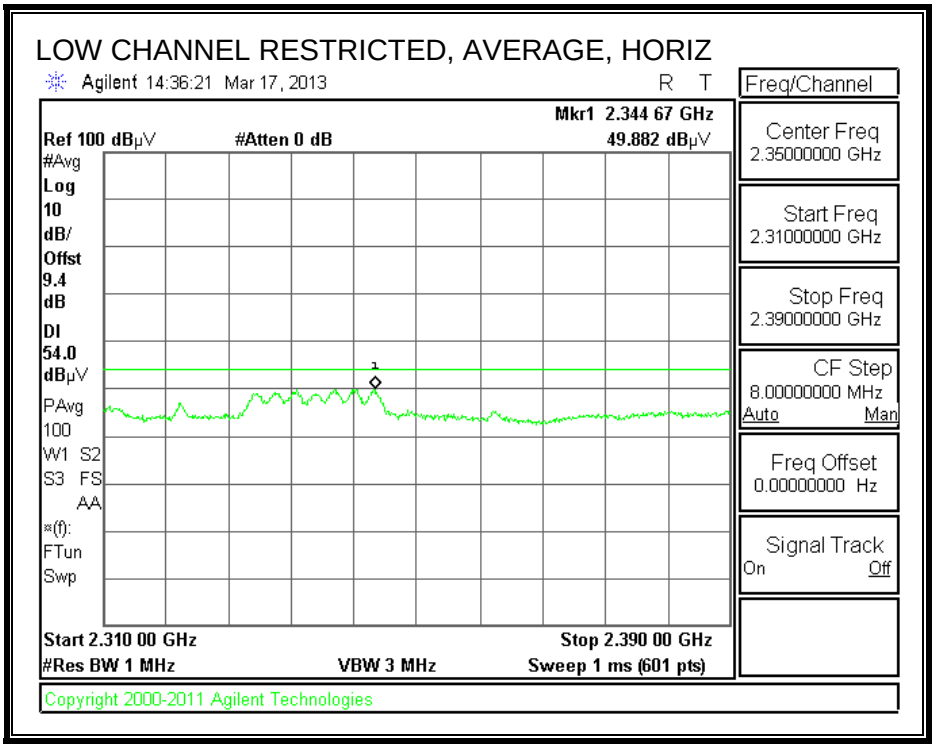




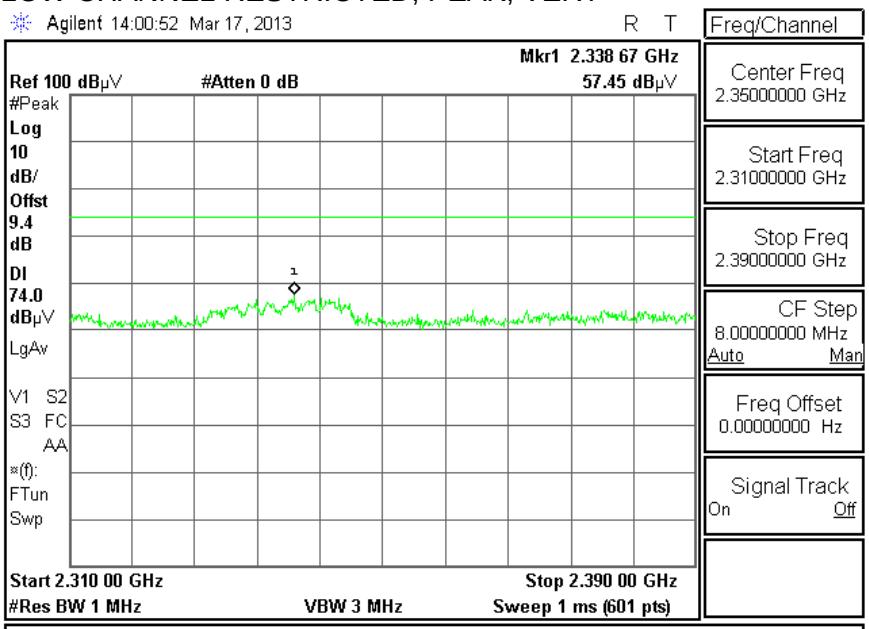


RESTRICTED BANDEDGE (LOW CHANNEL) CH2

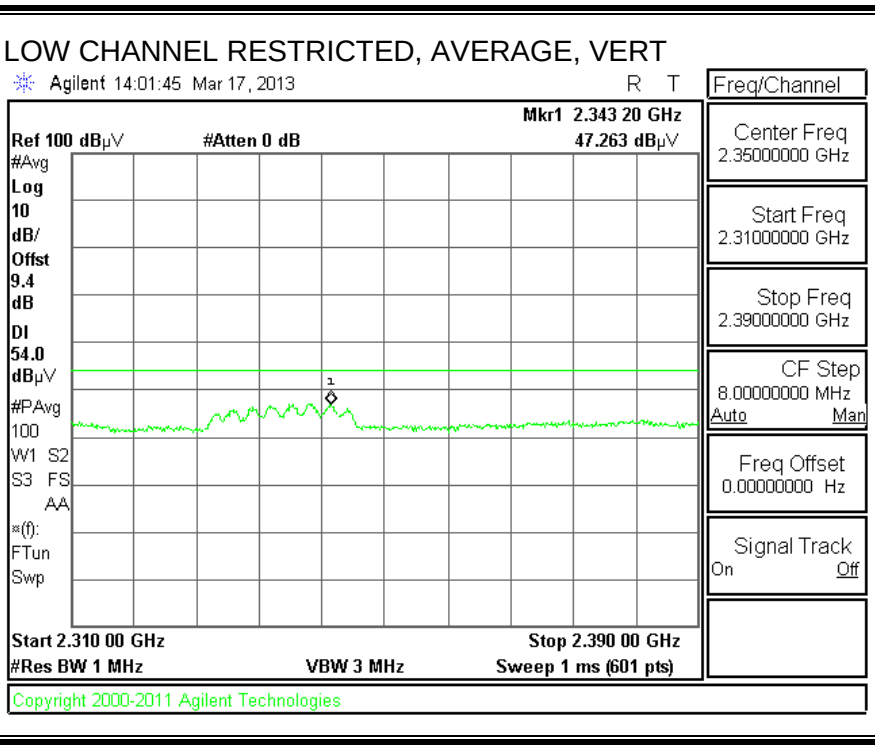




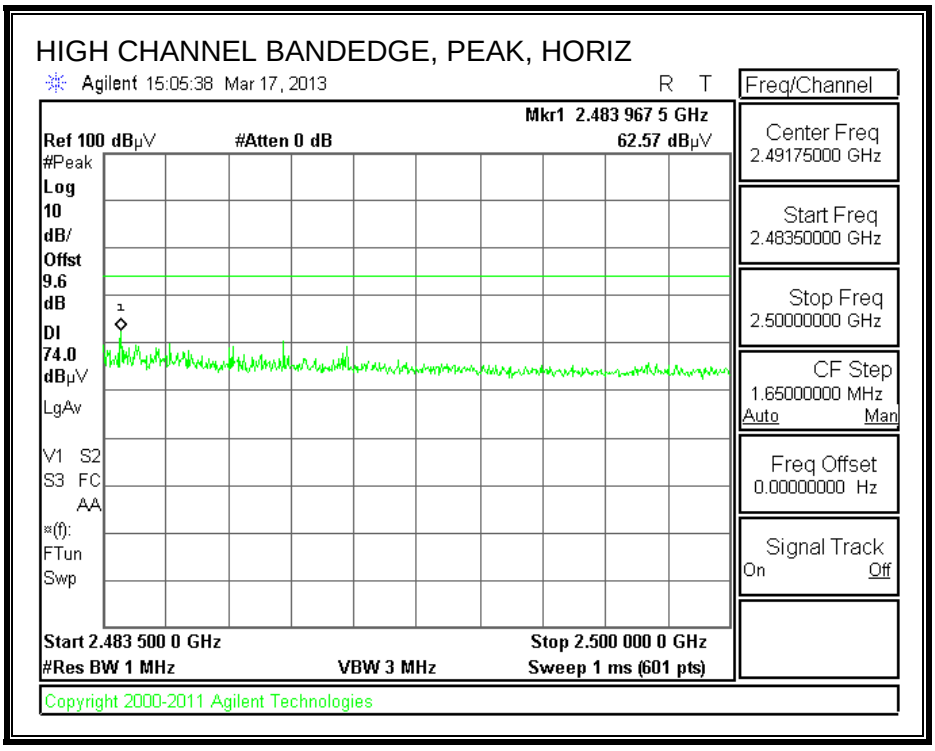
LOW CHANNEL RESTRICTED, PEAK, VERT

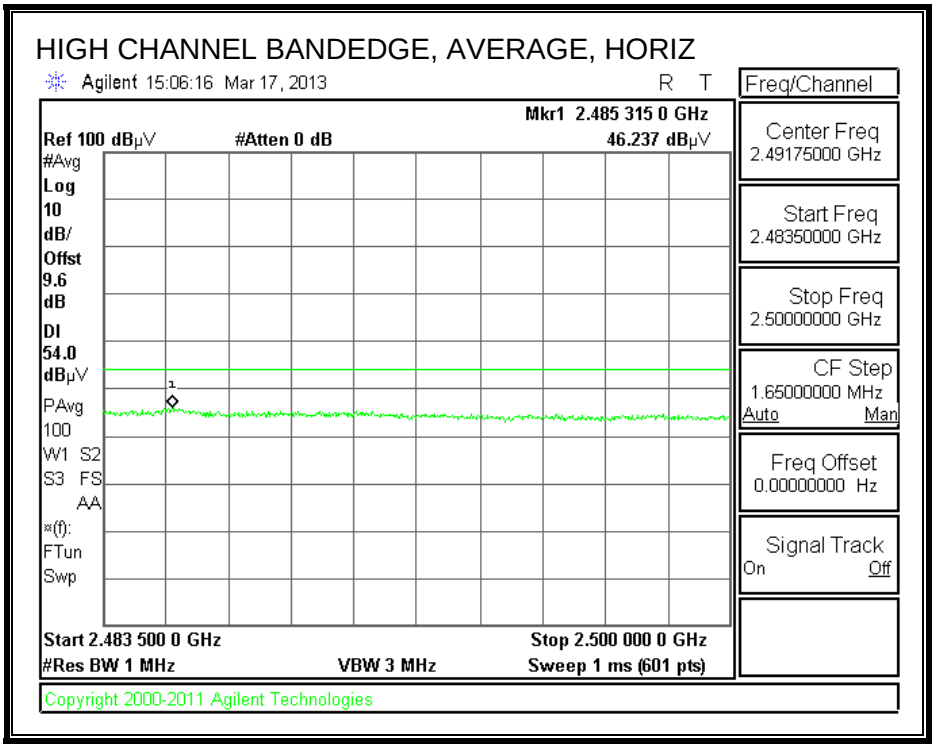


LOW CHANNEL RESTRICTED, AVERAGE, VERT

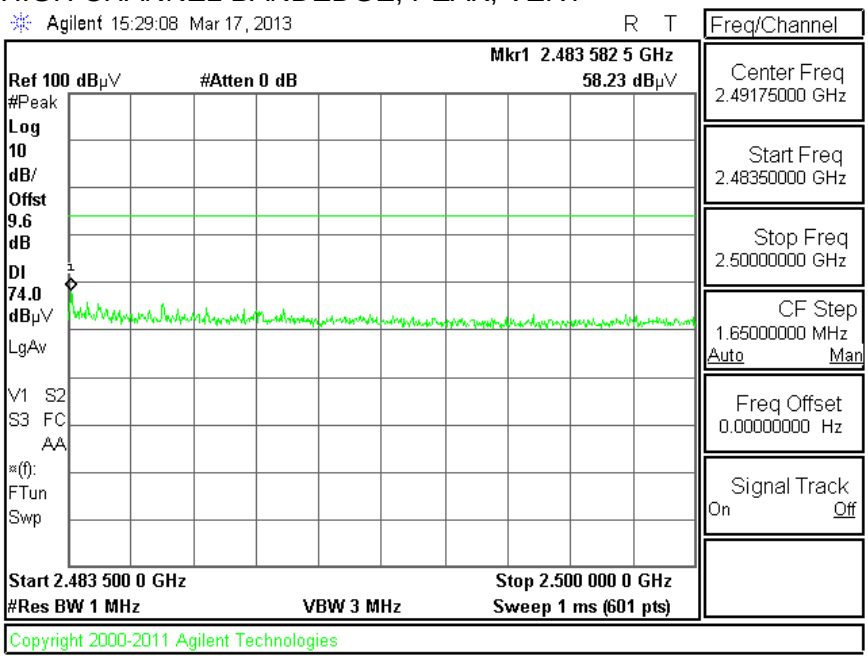


AUTHORIZED BANDEDGE (HIGH CHANNEL) CH10

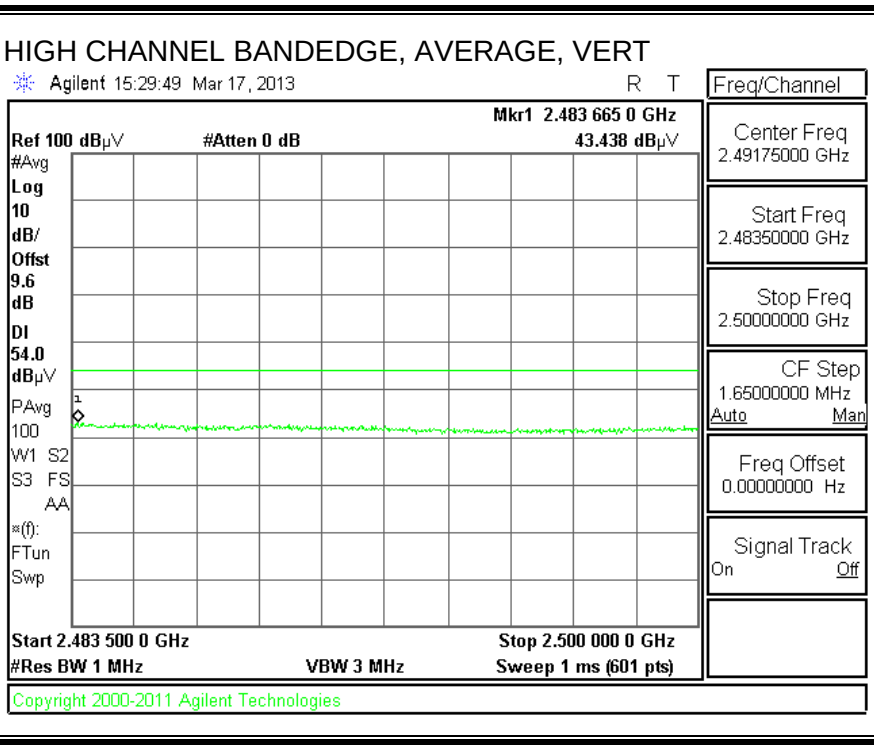




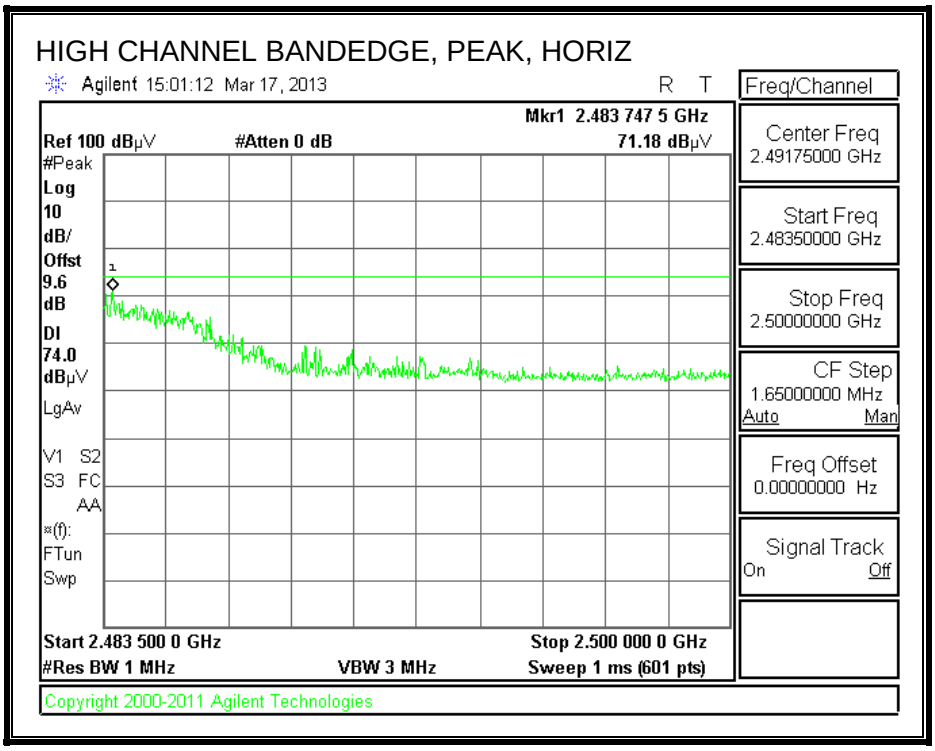
HIGH CHANNEL BANDEDGE, PEAK, VERT

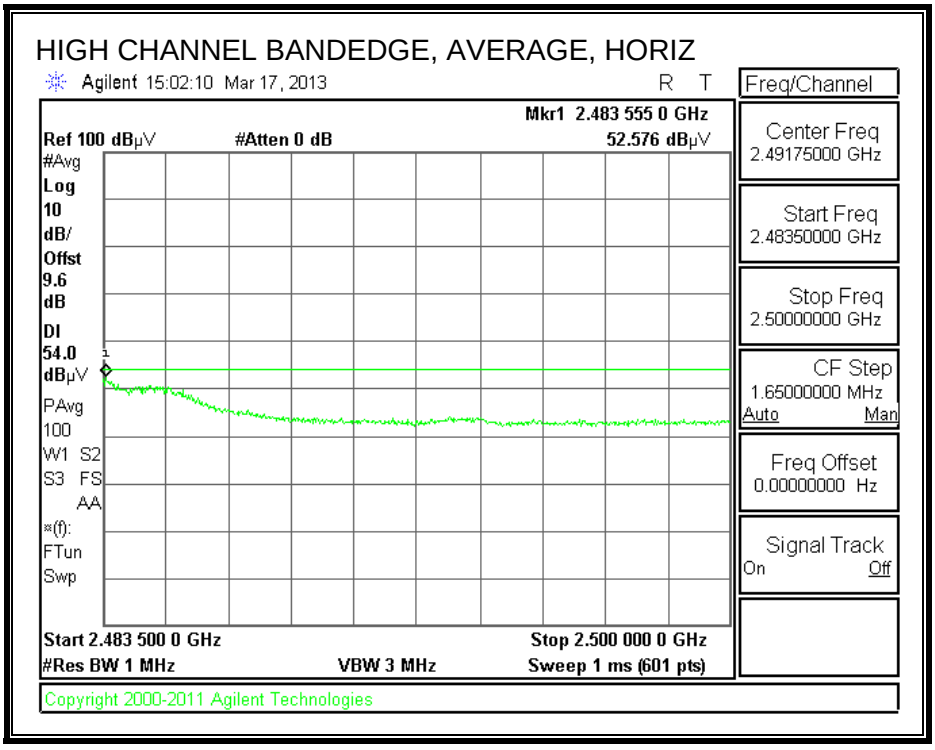


HIGH CHANNEL BANDEDGE, AVERAGE, VERT

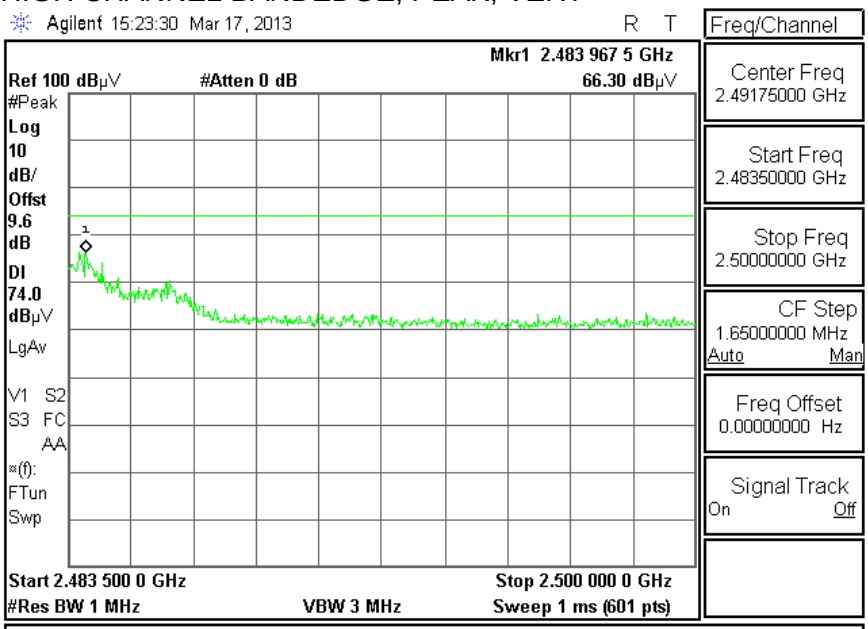


AUTHORIZED BANDEDGE (HIGH CHANNEL) CH11

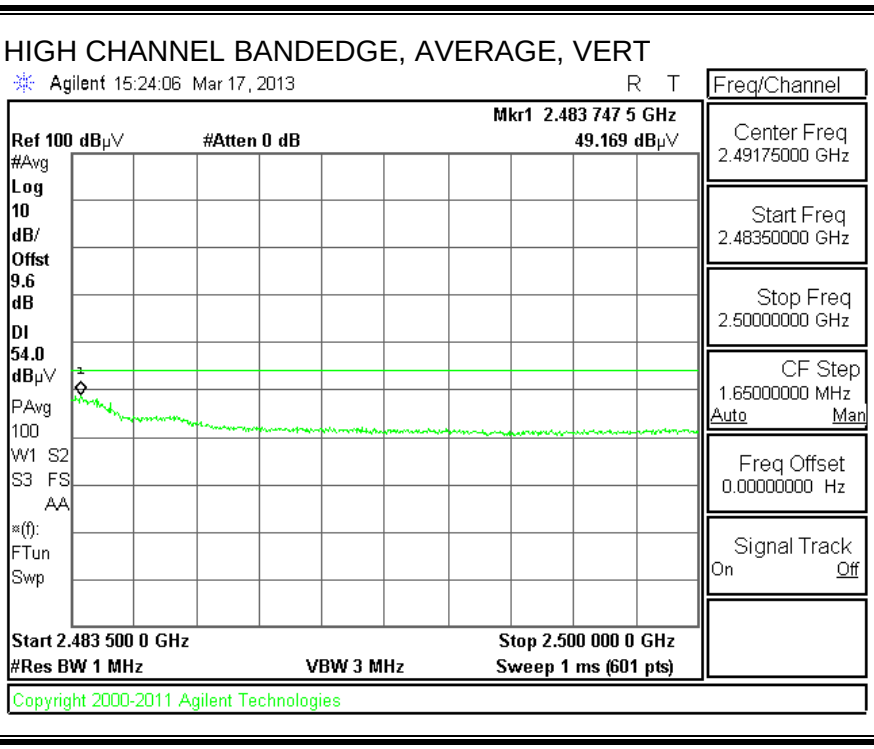




HIGH CHANNEL BANDEDGE, PEAK, VERT



HIGH CHANNEL BANDEDGE, AVERAGE, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 03/15/13
Project #: 12U14745
Company: Apple
Test Target: FCC Class B
Mode Oper: BF HT20 3TX mode

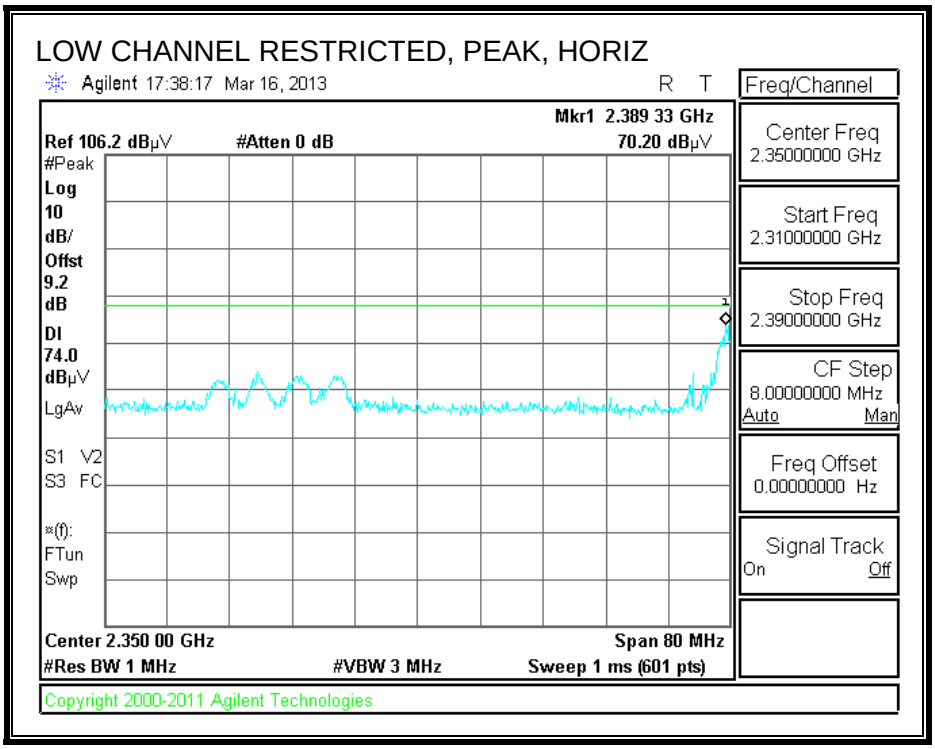
f	Measurement Frequency	Amp	Preamp Gain	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter	

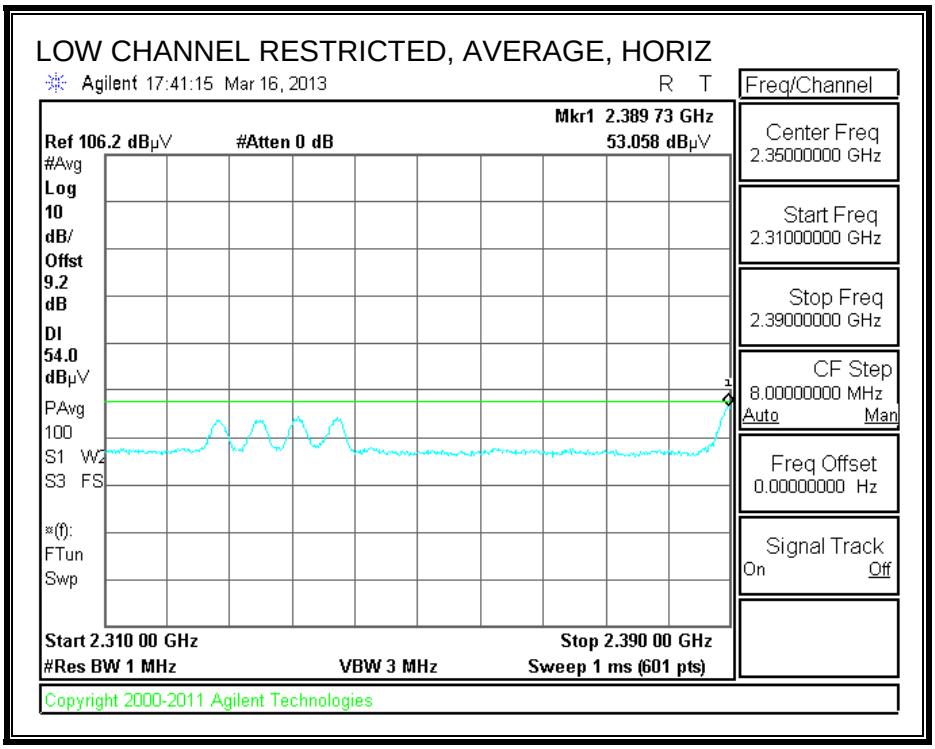
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
2412 MHz BF HT20 3TX													
4.824	3.0	41.2	33.6	6.3	-35.5	0.0	0.0	45.5	74.0	-28.5	V	P	
4.824	3.0	28.7	33.6	6.3	-35.5	0.0	0.0	33.0	54.0	-21.0	V	A	
4.824	3.0	50.8	33.6	6.3	-35.5	0.0	0.0	55.2	74.0	-18.8	H	P	
4.824	3.0	39.0	33.6	6.3	-35.5	0.0	0.0	43.3	54.0	-10.7	H	A	
2437 MHz BF HT20 3TX													
4.874	3.0	53.6	33.6	6.3	-35.5	0.0	0.0	58.0	74.0	-16.0	H	P	
4.874	3.0	42.2	33.6	6.3	-35.5	0.0	0.0	46.6	54.0	-7.4	H	A	
4.874	3.0	38.8	33.6	6.3	-35.5	0.0	0.0	43.2	74.0	-30.8	V	P	
4.874	3.0	28.3	33.6	6.3	-35.5	0.0	0.0	32.7	54.0	-21.3	V	A	
2462 MHz BF HT20 3TX													
4.924	3.0	54.4	33.6	6.3	-35.5	0.0	0.0	58.9	74.0	-15.1	H	P	
4.924	3.0	42.3	33.6	6.3	-35.5	0.0	0.0	46.8	54.0	-7.2	H	A	
4.924	3.0	39.4	33.6	6.3	-35.5	0.0	0.0	43.9	74.0	-30.1	V	P	
4.924	3.0	28.7	33.6	6.3	-35.5	0.0	0.0	33.2	54.0	-20.8	V	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

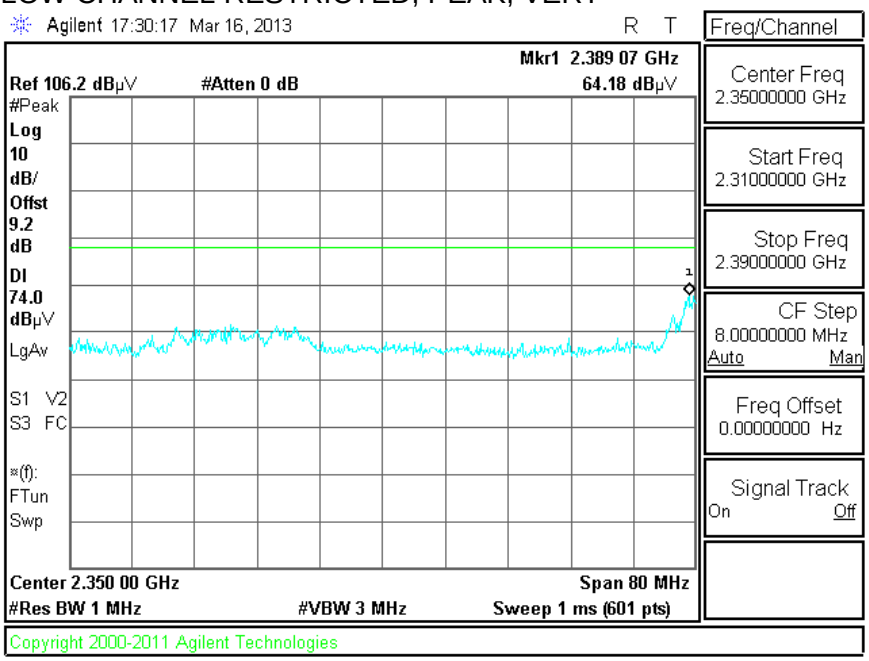
9.12. TX ABOVE 1 GHz 802.11n HT20 BF 3TX MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL) CH1

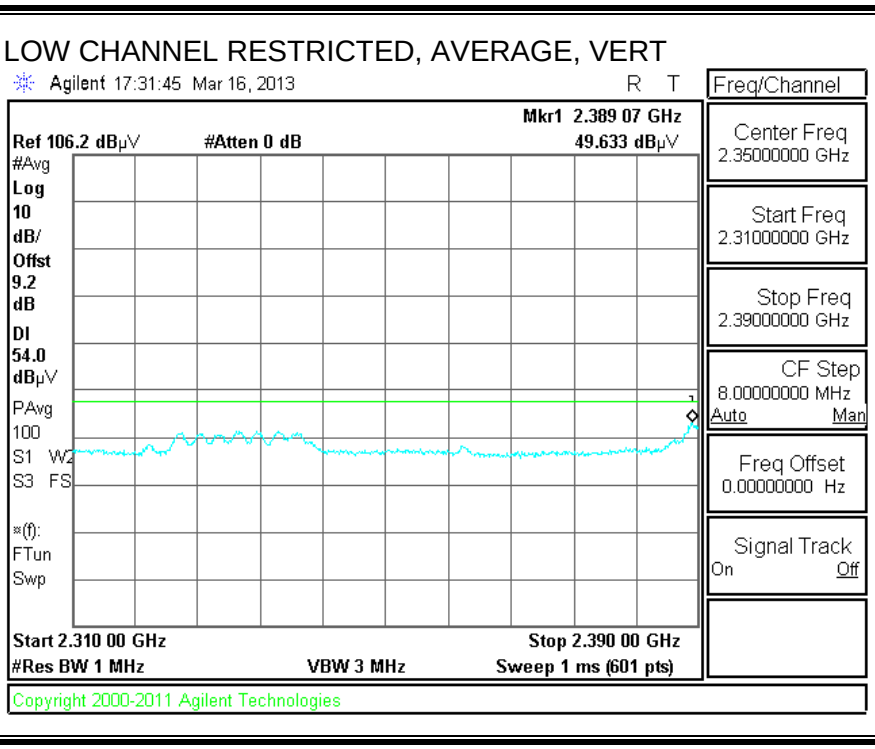




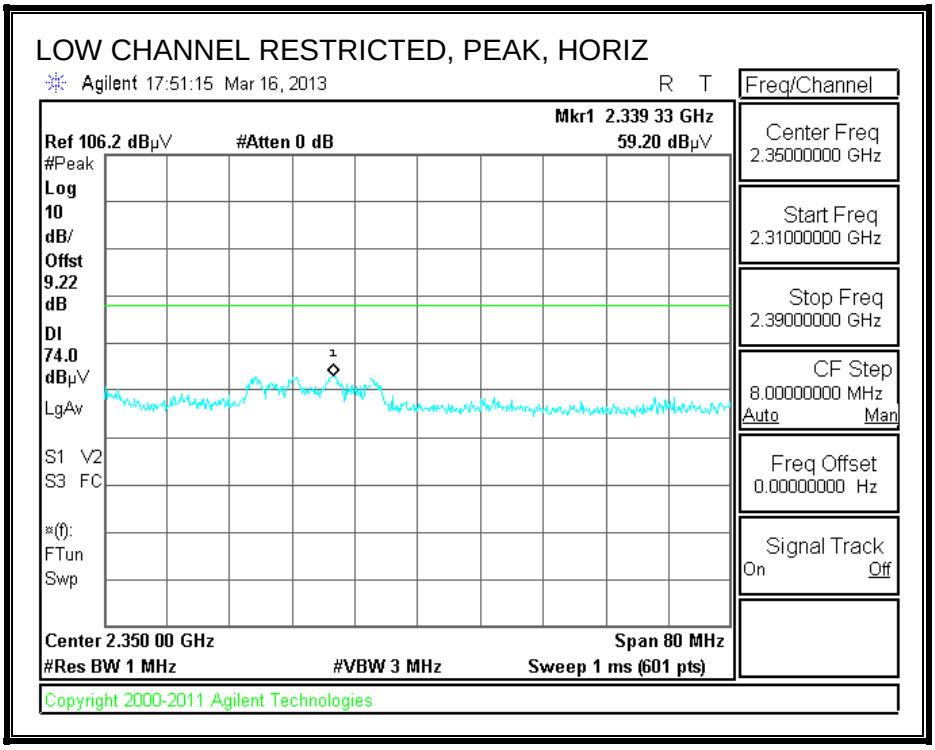
LOW CHANNEL RESTRICTED, PEAK, VERT

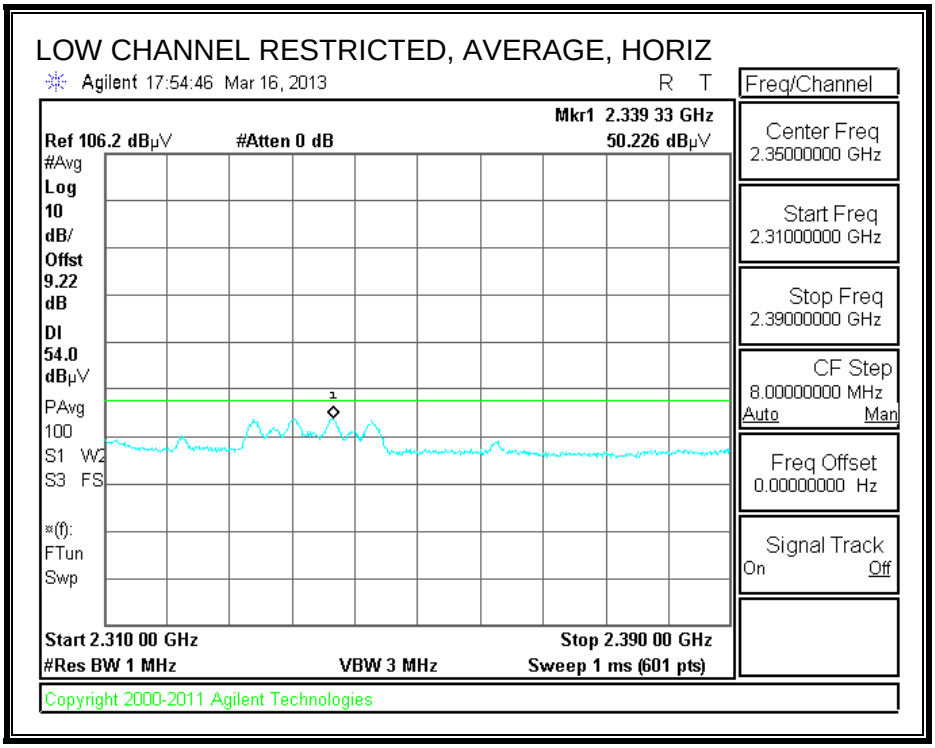


LOW CHANNEL RESTRICTED, AVERAGE, VERT

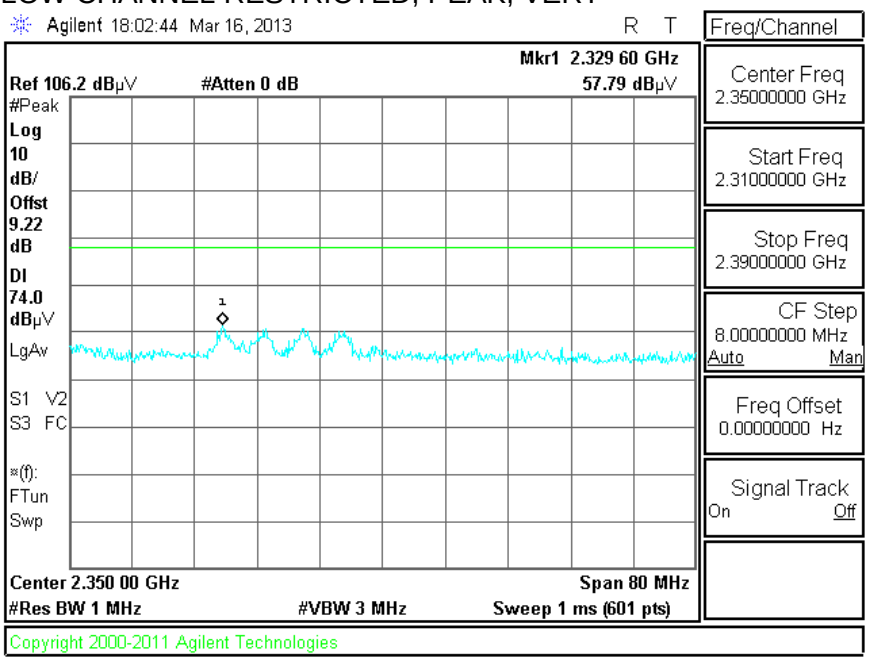


RESTRICTED BANDEDGE (LOW CHANNEL) CH2

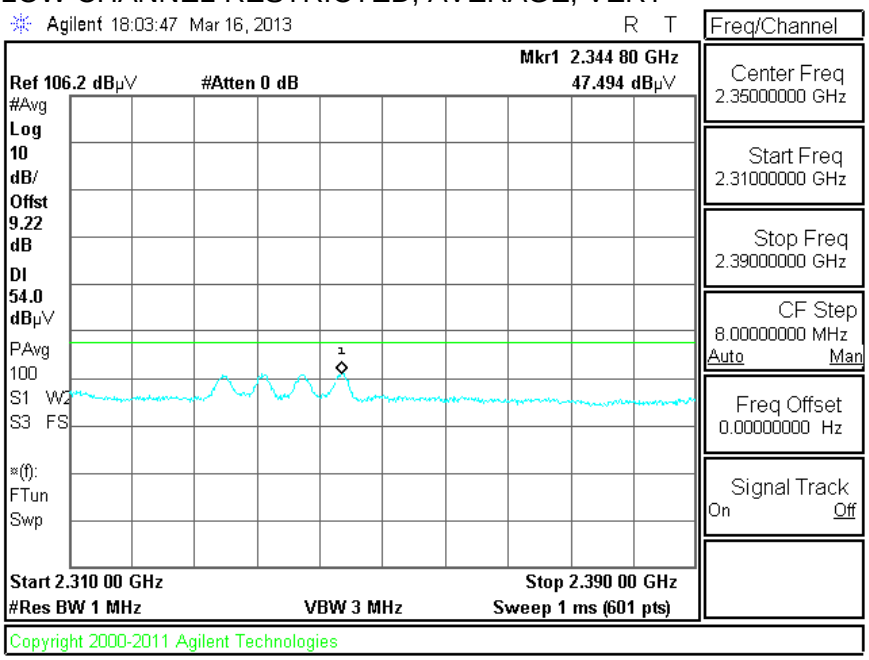




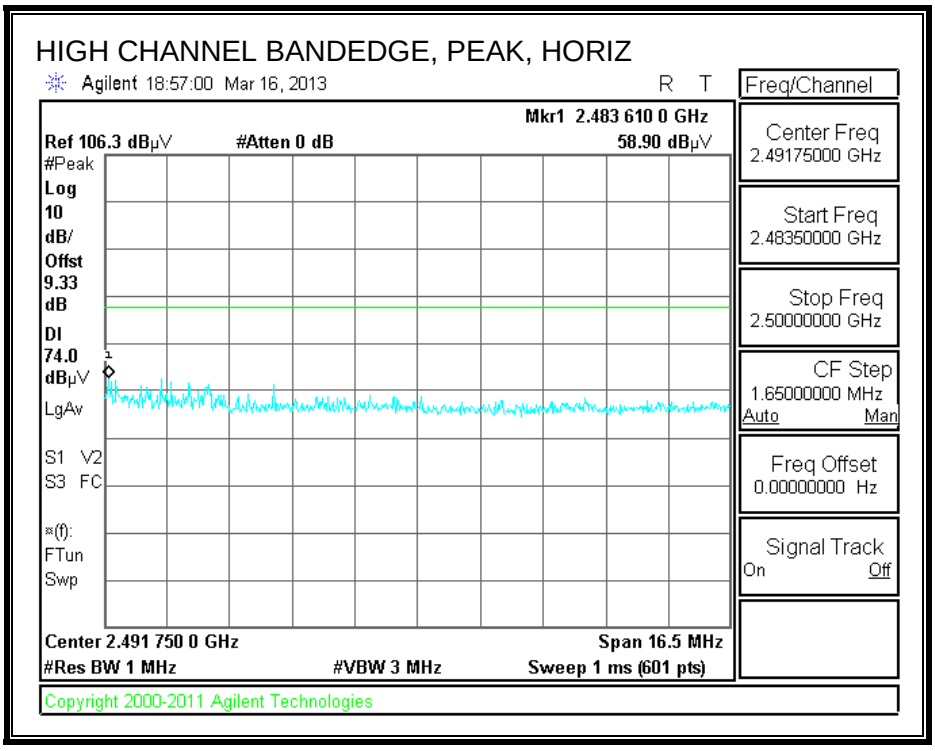
LOW CHANNEL RESTRICTED, PEAK, VERT

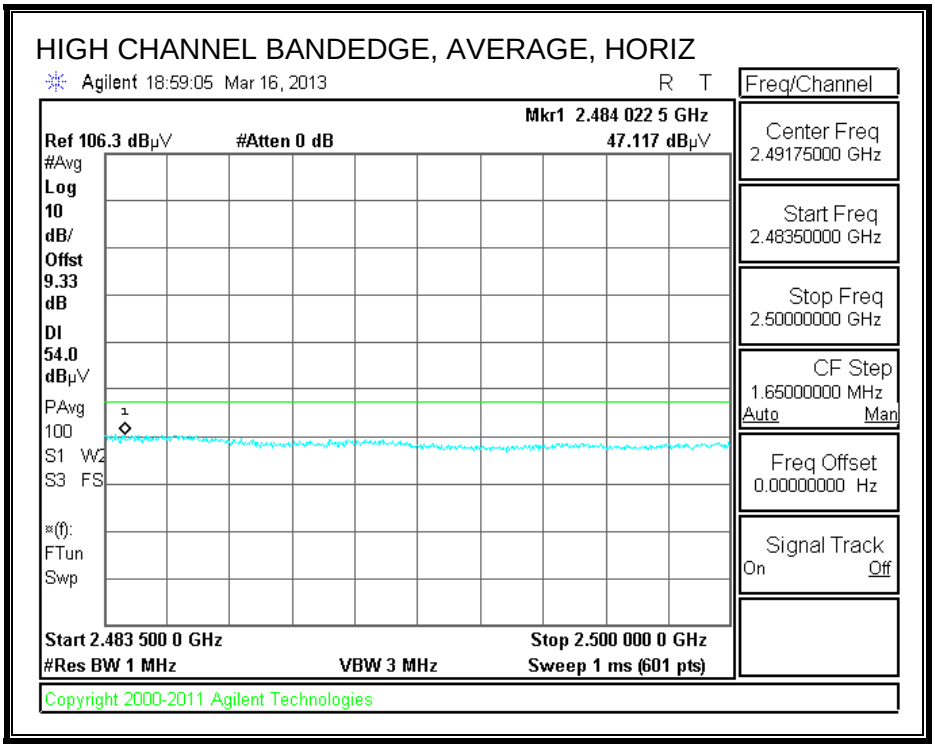


LOW CHANNEL RESTRICTED, AVERAGE, VERT

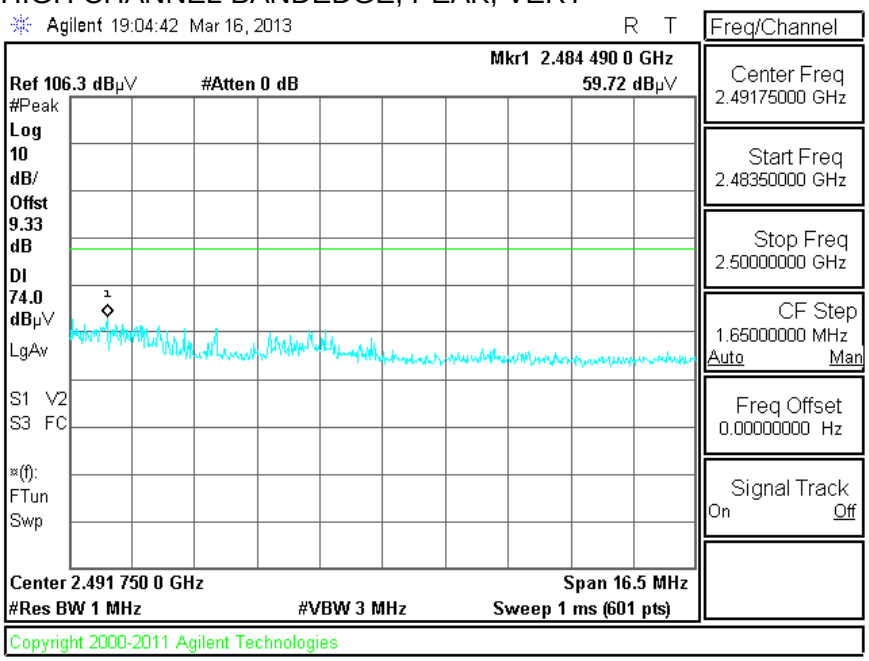


AUTHORIZED BANDEDGE (HIGH CHANNEL) CH10

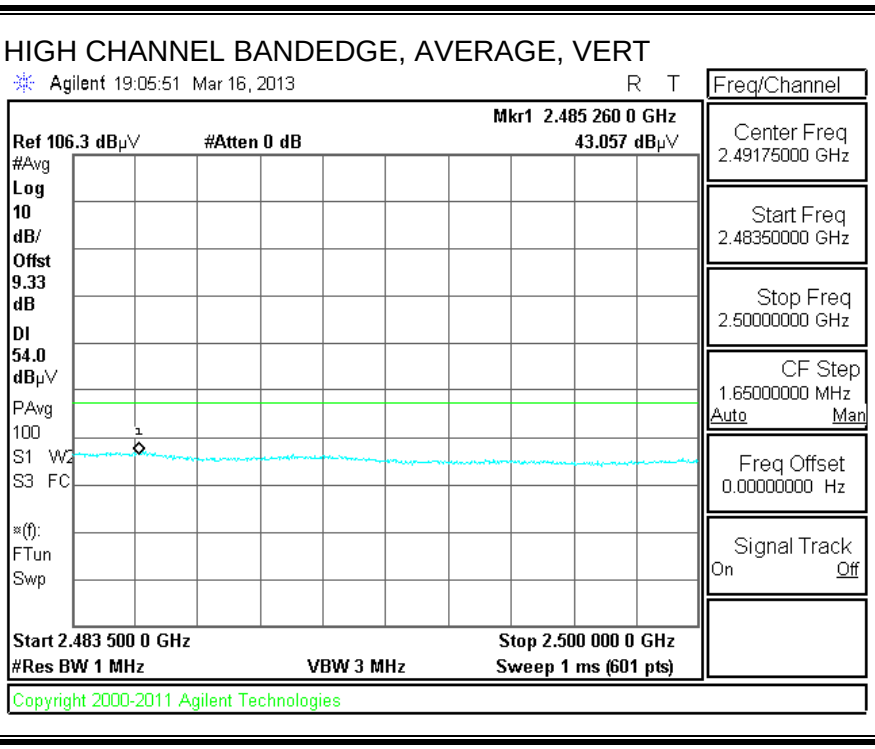




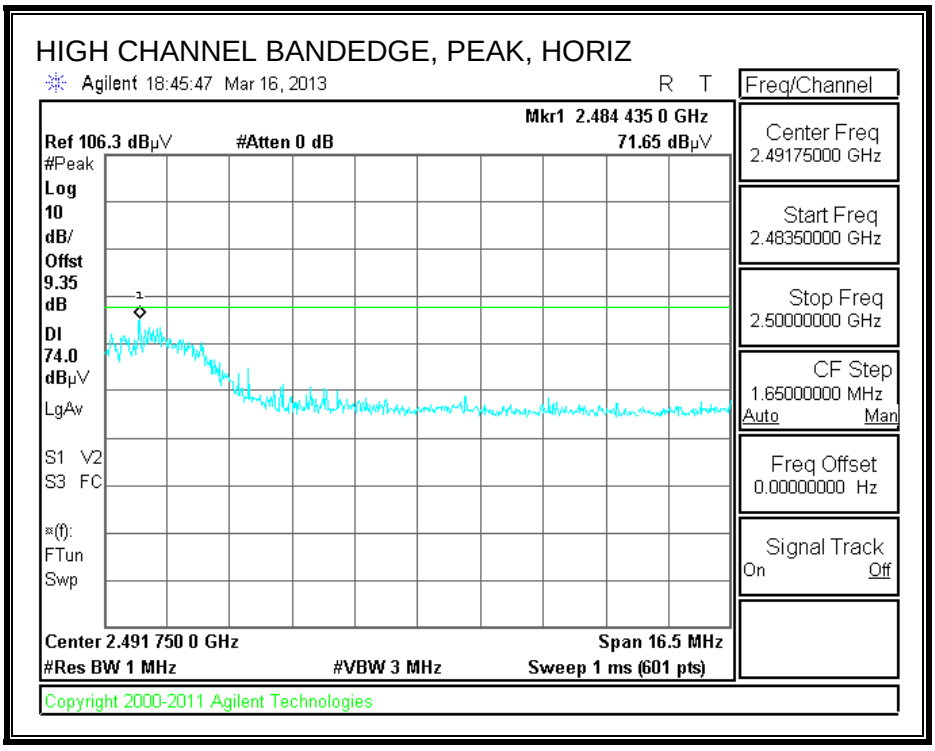
HIGH CHANNEL BANDEDGE, PEAK, VERT

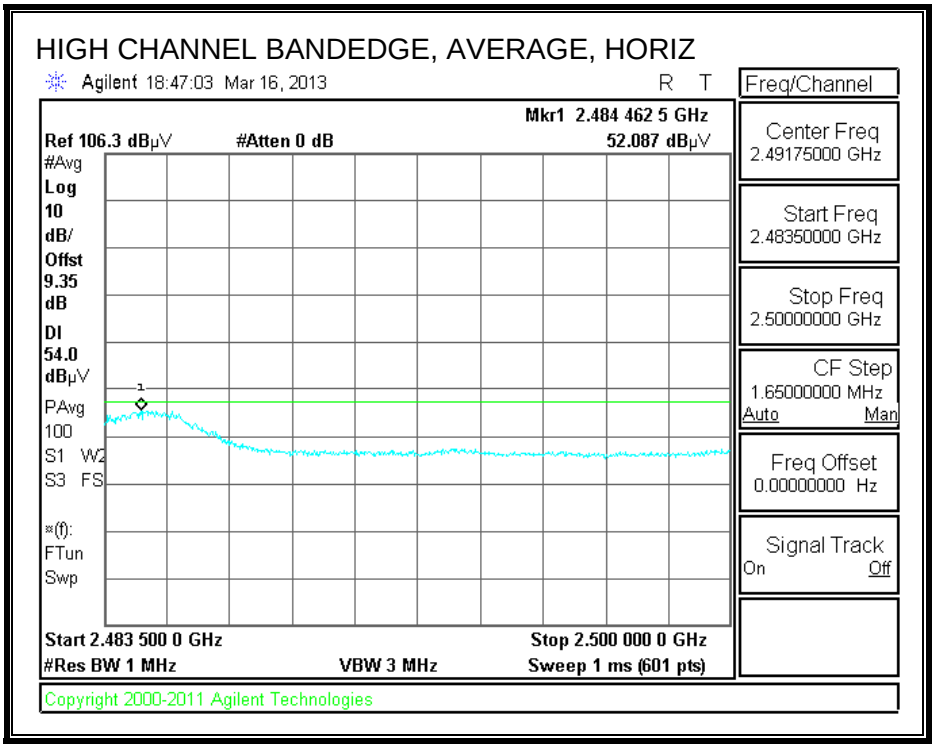


HIGH CHANNEL BANDEDGE, AVERAGE, VERT

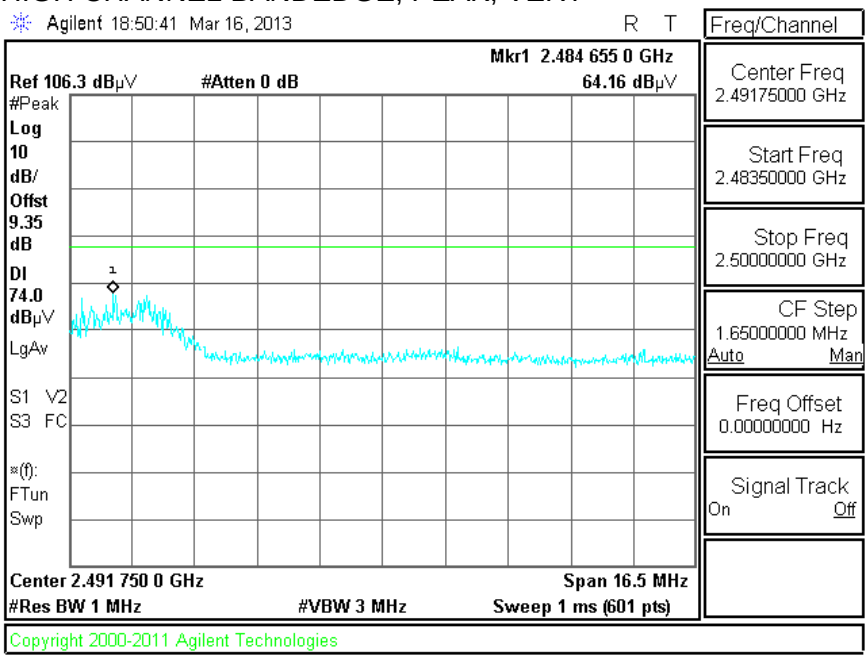


AUTHORIZED BANDEDGE (HIGH CHANNEL) CH11

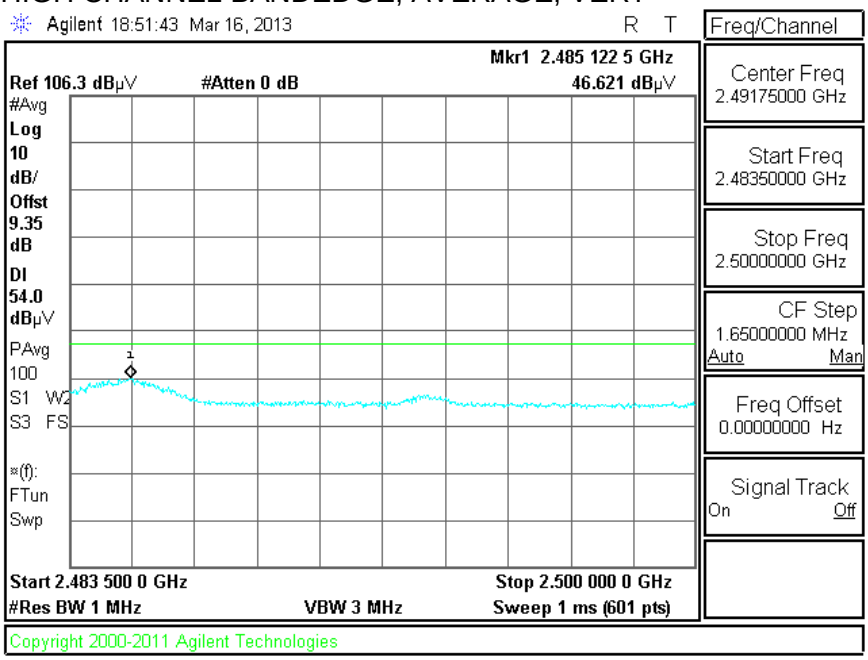




HIGH CHANNEL BANDEDGE, PEAK, VERT



HIGH CHANNEL BANDEDGE, AVERAGE, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 03/15/13
Project #: 12U14745
Company: Apple
Test Target: FCC Class B
Mode Oper: BF HT20 3TX mode

f	Measurement Frequency	Amp	Preamp Gain	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter	

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
2412 MHz BF HT20 3TX													
4.824	3.0	41.2	33.6	6.3	-35.5	0.0	0.0	45.5	74.0	-28.5	V	P	
4.824	3.0	28.7	33.6	6.3	-35.5	0.0	0.0	33.0	54.0	-21.0	V	A	
4.824	3.0	50.8	33.6	6.3	-35.5	0.0	0.0	55.2	74.0	-18.8	H	P	
4.824	3.0	39.0	33.6	6.3	-35.5	0.0	0.0	43.3	54.0	-10.7	H	A	
2437 MHz BF HT20 3TX													
4.874	3.0	53.6	33.6	6.3	-35.5	0.0	0.0	58.0	74.0	-16.0	H	P	
4.874	3.0	42.2	33.6	6.3	-35.5	0.0	0.0	46.6	54.0	-7.4	H	A	
4.874	3.0	38.8	33.6	6.3	-35.5	0.0	0.0	43.2	74.0	-30.8	V	P	
4.874	3.0	28.3	33.6	6.3	-35.5	0.0	0.0	32.7	54.0	-21.3	V	A	
2462 MHz BF HT20 3TX													
4.924	3.0	54.4	33.6	6.3	-35.5	0.0	0.0	58.9	74.0	-15.1	H	P	
4.924	3.0	42.3	33.6	6.3	-35.5	0.0	0.0	46.8	54.0	-7.2	H	A	
4.924	3.0	39.4	33.6	6.3	-35.5	0.0	0.0	43.9	74.0	-30.1	V	P	
4.924	3.0	28.7	33.6	6.3	-35.5	0.0	0.0	33.2	54.0	-20.8	V	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

9.13. TX ABOVE 1 GHz 802.11a 1TX MODE IN THE 5.8 GHz BAND

Covered by testing HT20 CDD MCS0 3TX, total power across all three chains is higher than the power level the device will operate at.

9.14. TX ABOVE 1 GHz 802.11a 2TX MODE IN THE 5.8 GHz BAND

Covered by testing HT20 CDD MCS0 3TX, total power across all three chains is higher than the power level the device will operate at.

9.15. TX ABOVE 1 GHz 802.11a 3TX MODE IN THE 5.8 GHz BAND

Covered by testing HT20 CDD MCS0 3TX, total power across all three chains is higher than the power level the device will operate at.

9.16. TX ABOVE 1 GHz 802.11n HT20 1TX MODE IN THE 5.8 GHz BAND

Covered by testing HT20 CDD MCS0 3TX, total power across all three chains is higher than the power level the device will operate at.

9.17. TX ABOVE 1 GHz 802.11n HT20 2TX MODE IN THE 5.8 GHz BAND

Covered by testing HT20 CDD MCS0 3TX, total power across all three chains is higher than the power level the device will operate at.

9.18. TX ABOVE 1 GHz 802.11n HT20 CDD 3TX MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 02/19/13
Project #: 12U14745
Company: Apple
Test Target: FCC Class B
Mode Oper: HT20 TX mode

f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
5745MHz HT20 3TX CDD													
11.490	3.0	32.4	38.9	11.2	-33.1	0.0	0.7	50.1	74.0	-23.9	V	P	
11.490	3.0	20.2	38.9	11.2	-33.1	0.0	0.7	37.9	54.0	-16.1	V	A	
11.490	3.0	33.5	38.9	11.2	-33.1	0.0	0.7	51.2	74.0	-22.8	H	P	
11.490	3.0	21.2	38.9	11.2	-33.1	0.0	0.7	38.9	54.0	-15.1	H	A	
5785MHz HT20 3TX CDD													
11.570	3.0	34.8	38.9	11.3	-33.0	0.0	0.7	52.8	74.0	-21.2	H	P	
11.570	3.0	22.0	38.9	11.3	-33.0	0.0	0.7	40.0	54.0	-14.0	H	A	
11.570	3.0	33.9	38.9	11.3	-33.0	0.0	0.7	51.9	74.0	-22.1	V	P	
11.570	3.0	20.4	38.9	11.3	-33.0	0.0	0.7	38.4	54.0	-15.6	V	A	
5825MHz HT20 3TX CDD													
11.650	3.0	33.5	39.0	11.4	-32.9	0.0	0.7	51.7	74.0	-22.3	V	P	
11.650	3.0	20.9	39.0	11.4	-32.9	0.0	0.7	39.2	54.0	-14.8	V	A	
11.650	3.0	34.2	39.0	11.4	-32.9	0.0	0.7	52.5	74.0	-21.5	H	P	
11.650	3.0	22.4	39.0	11.4	-32.9	0.0	0.7	40.7	54.0	-13.3	H	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

9.19. TX ABOVE 1 GHz 802.11n BF 2TX MODE IN THE 5.8 GHz BAND

Covered by testing AC20 CDD MCS0 3TX, total power across all three chains is higher than the power level the device will operate at.

9.20. TX ABOVE 1 GHz 802.11n HT20 BF 3TX MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber-A

Company: APPLE
Project #: 12u14745
Date: 3/17/2013
Test Engineer: MENGISTU MEKURIA
Configuration: EUT ALONE
Mode: TX, BF 3TX_HT20 MODE

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T136; M/N: 3117 @3m	T144 Miteq 3008A00931	T88 Miteq 26-40GHz	T39; ARA 18-26GHz; S/N:1013	FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

Peak Measurements
RBW=1MHz ; VBW=3MHz
Average Measurements
RBW=1MHz ; VBW=3MHz
Average Det

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (5745 MHz)															
11.490	3.0	39.4	29.4	38.1	11.2	-35.9	0.0	0.7	53.4	43.5	74	54	-20.6	-10.5	H
11.490	3.0	37.9	27.8	38.1	11.2	-35.9	0.0	0.7	51.9	41.9	74	54	-22.1	-12.1	V
Mid Channel (5785 MHz)															
11.570	3.0	39.5	30.5	38.1	11.2	-35.8	0.0	0.7	53.7	44.7	74	54	-20.3	-9.3	H
11.570	3.0	37.7	27.6	38.1	11.2	-35.8	0.0	0.7	52.0	41.8	74	54	-22.0	-12.2	V
Hi Channel (5825 MHz)															
11.650	3.0	42.1	31.8	38.2	11.3	-35.8	0.0	0.7	56.5	46.2	74	54	-17.5	-7.8	H
11.650	3.0	38.4	28.4	38.2	11.3	-35.8	0.0	0.7	52.7	42.7	74	54	-21.3	-11.3	V

Rev. 01.30.13

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

9.21. TX ABOVE 1 GHz 802.11n HT40 1TX MODE IN THE 5.8 GHz BAND

Covered by testing HT40 CDD MCS0 3TX, total power across all three chains is higher than the power level the device will operate at.

9.22. TX ABOVE 1 GHz 802.11n HT40 2TX MODE IN THE 5.8 GHz BAND

Covered by testing HT40 CDD MCS0 3TX, total power across all three chains is higher than the power level the device will operate at.

9.23. TX ABOVE 1 GHz 802.11n HT40 CDD 3TX MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 02/27/13
Project #: 12U14745
Company: Apple
Test Target: FCC Class B
Mode Oper: HT40 TX mode

f	Measurement Frequency	Amp	Preamp Gain	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter	

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
5755MHz HT40 3TX CDD													
11.510	3.0	33.5	38.9	11.2	-33.0	0.0	0.7	51.3	74.0	-22.7	H	P	
11.510	3.0	20.9	38.9	11.2	-33.0	0.0	0.7	38.7	54.0	-15.3	H	A	
5755MHz HT40 3TX CDD													
11.510	3.0	32.6	38.9	11.2	-33.0	0.0	0.7	50.4	74.0	-23.6	V	P	
11.510	3.0	19.3	38.9	11.2	-33.0	0.0	0.7	37.0	54.0	-17.0	V	A	
5795MHz HT40 3TX CDD													
11.590	3.0	33.0	39.0	11.3	-33.0	0.0	0.7	51.1	74.0	-22.9	V	P	
11.590	3.0	19.8	39.0	11.3	-33.0	0.0	0.7	37.9	54.0	-16.1	V	A	
5795MHz HT40 3TX CDD													
11.590	3.0	34.8	39.0	11.3	-33.0	0.0	0.7	52.8	74.0	-21.2	H	P	
11.590	3.0	21.3	39.0	11.3	-33.0	0.0	0.7	39.4	54.0	-14.6	H	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

9.24. TX ABOVE 1 GHz 802.11n HT40 BF 2TX MODE IN THE 5.8 GHz BAND

Covered by testing AC40 CDD MCS0 3TX, total power across all three chains is higher than the power level the device will operate at

9.25. TX ABOVE 1 GHz 802.11n HT40 BF 3TX MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber-A

Company: APPLE
Project #: 12u14745
Date: 3/17/2013
Test Engineer: MENGISTU MEKURIA
Configuration: EUT ALONE
Mode: TX., BF 3TX

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T136; M/N: 3117 @3m	T144 Miteq 3008A00931	T88 Miteq 26-40GHz	T39; ARA 18-26GHz; S/N:1013	FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

Peak Measurements
RBW=1MHz ; VBW=3MHz
Average Measurements
RBW=1MHz ; VBW=3MHz
Average Det

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (5755 MHz)															
11.510	3.0	37.0	26.7	38.1	11.2	-35.8	0.0	0.7	51.1	40.8	74	54	-22.9	-13.2	H
11.510	3.0	35.8	26.2	38.1	11.2	-35.8	0.0	0.7	49.9	40.3	74	54	-24.1	-13.7	V
Hi Channel (5795 MHz)															
11.590	3.0	38.4	27.7	38.2	11.2	-35.8	0.0	0.7	52.6	41.9	74	54	-21.4	-12.1	H
11.590	3.0	35.7	26.0	38.2	11.2	-35.8	0.0	0.7	50.0	40.3	74	54	-24.0	-13.7	V

Rev. 01.30.13

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

9.26. TX ABOVE 1 GHz 802.11ac VHT80 1TX MODE IN THE 5.8 GHz BAND

Covered by testing AC80 3TX, total power across all three chains is higher than the power level the device will operate at.

9.27. TX ABOVE 1 GHz 802.11ac VHT80 2TX MODE IN THE 5.8 GHz BAND

Covered by testing AC80 3TX, total power across all three chains is higher than the power level the device will operate at.

9.28. TX ABOVE 1 GHz 802.11ac VHT80 CDD 3TX MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 02/19/13
Project #: 12U14745
Company: Apple
Test Target: FCC Class B
Mode Oper: HT80 TX mode

f	Measurement Frequency	Amp	Preamp Gain	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter	

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
5775MHz HT80 3TX CDD													
11.550	3.0	33.1	38.9	11.3	-33.0	0.0	0.7	51.0	74.0	-23.0	H	P	
11.550	3.0	20.2	38.9	11.3	-33.0	0.0	0.7	38.1	54.0	-15.9	H	A	
5775MHz HT80 3TX CDD													
11.550	3.0	32.1	38.9	11.3	-33.0	0.0	0.7	50.0	74.0	-24.0	V	P	
11.550	3.0	21.9	38.9	11.3	-33.0	0.0	0.7	39.8	54.0	-14.2	V	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

9.29. TX ABOVE 1 GHz 802.11ac VHT80 BF 2TX MODE IN THE 5.8 GHz BAND

Covered by testing AC80 BF 3TX, total power across all three chains is higher than the power level the device will operate at.

9.30. TX ABOVE 1 GHz 802.11ac VHT80 BF 3TX MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber-A

Company: APPLE
Project #: 12u14745
Date: 3/17/2013
Test Engineer: MENGISTU MEKURIA
Configuration: EUT ALONE
Mode: TX., BF 3TX_HT80

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T136; M/N: 3117 @3m	T144 Miteq 3008A00931	T88 Miteq 26-40GHz	T39; ARA 18-26GHz; S/N:1013	FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

Peak Measurements
RBW=1MHz ; VBW=3MHz
Average Measurements
RBW=1MHz ; VBW=3MHz
Average det

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Mid Channel (5775 MHz)															
11.550	3.0	35.1	26.1	38.1	11.2	-35.8	0.0	0.7	49.3	40.3	74	54	-24.7	-13.7	H
11.550	3.0	35.4	25.6	38.1	11.2	-35.8	0.0	0.7	49.6	39.8	74	54	-24.4	-14.2	V

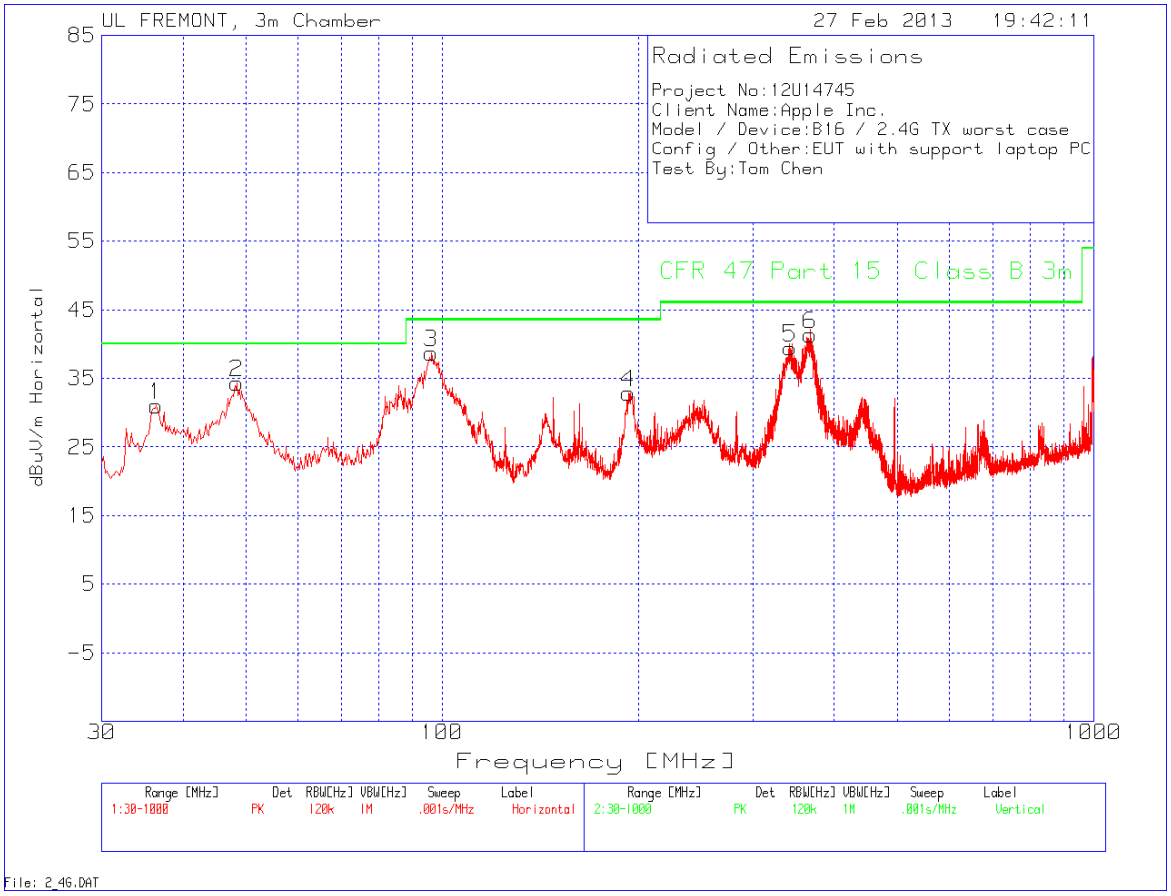
Rev. 01.30.13

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

9.31. WORST-CASE BELOW 1 GHz (2.4 GHz BAND)

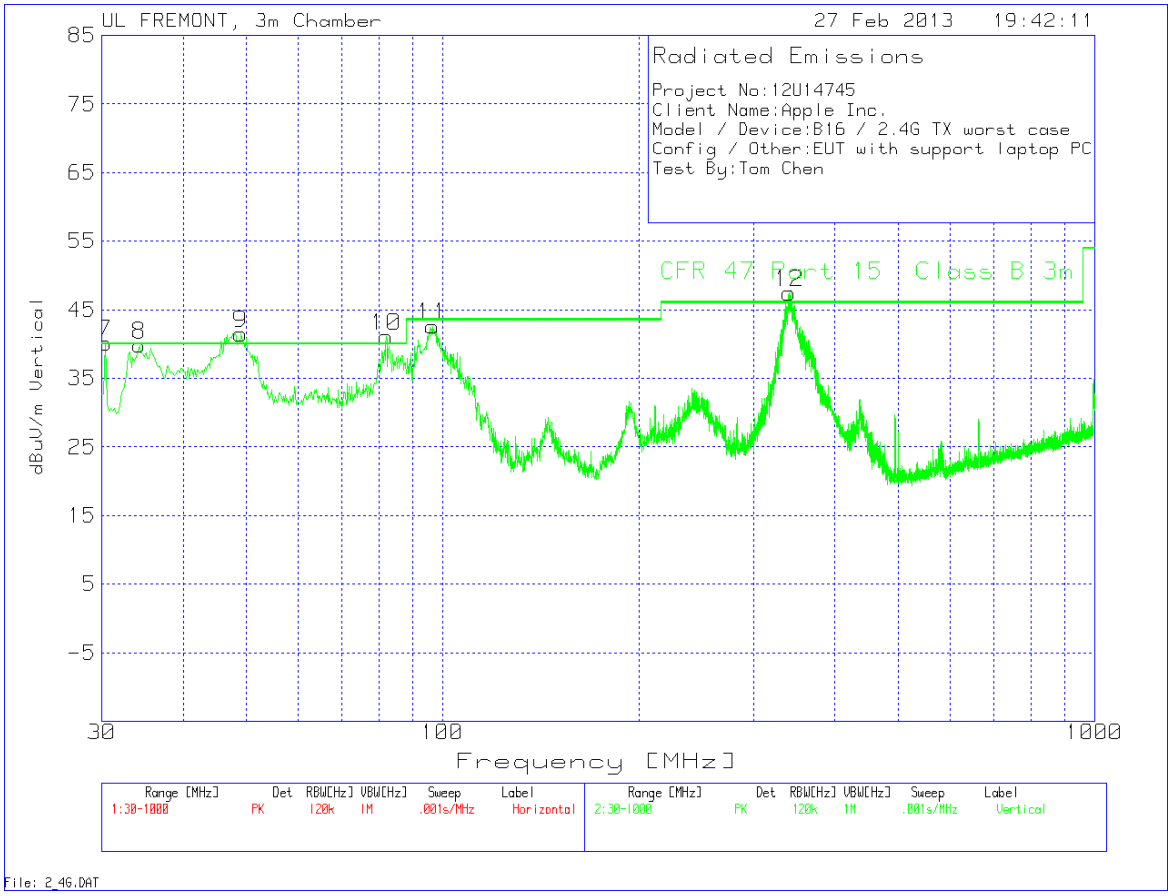
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

Project No:12U14745
Client Name:Apple Inc.
Model / Device:B16 / 2.4G TX worst case
Config / Other:EUT with support laptop PC
Test By:Tom Chen

Horizontal 30 - 1000MHz

Marker No.	Test Frequency	Meter Reading	Detector	T130 8-14-12 (dB)	3m Loop (dB)	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Polarity
1	36.3969	42.11	PK	16.3	-27.4	31.01	40	-8.99	Horz
2	48.4153	53.55	PK	8.1	-27.3	34.35	40	-5.65	Horz
3	96.295	56.29	PK	9.2	-26.8	38.69	43.5	-4.81	Horz
4	193.2174	47.2	PK	11.7	-26	32.9	43.5	-10.6	Horz
5	342.478	50.64	PK	14.1	-25.3	39.44	46	-6.56	Horz
6	367.2902	51.95	PK	14.9	-25.5	41.35	46	-4.65	Horz

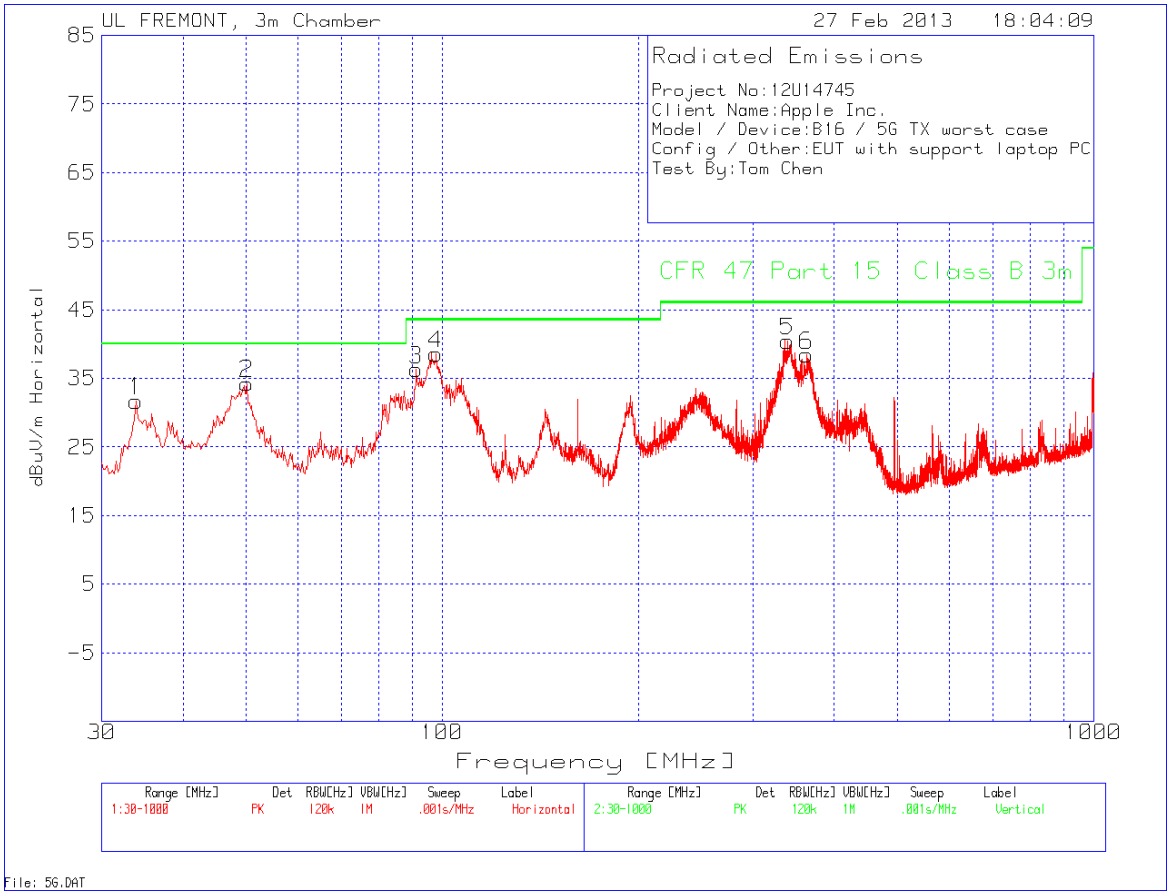
Vertical 30 - 1000MHz

Marker No.	Test Frequency	Meter Reading	Detector	T130 8-14-12 (dB)	3m Loop (dB)	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Polarity
7	30.8	34.57	QP	20.3	-27.5	27.37	40	-12.63	Vert
8	33.9802	44.23	QP	18	-27.5	34.73	40	-5.27	Vert
9	48.8976	56.45	QP	7.9	-27.3	37.05	40	-2.95	Vert
10	81.8909	52.65	QP	7.3	-27	32.95	40	-7.05	Vert
11	96.017	55.88	QP	9.1	-26.8	38.18	43.5	-5.32	Vert
12	340.346	53.57	QP	14	-25.3	42.27	46	-3.73	Vert

9.32. BAND WORST-CASE BELOW 1 GHz (5 GHz BANDS)

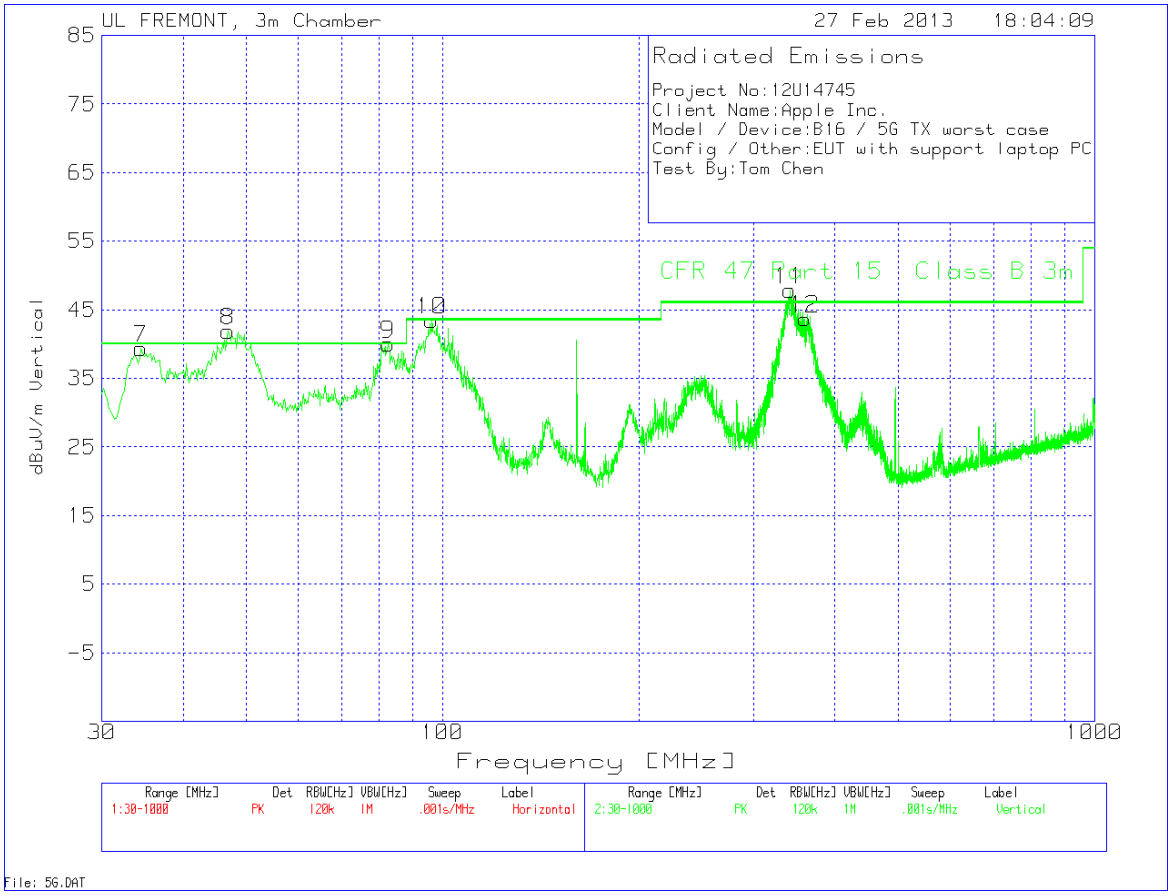
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

Project No:12U14745
Client Name:Apple Inc.
Model / Device:B16 / 5G TX worst case
Config / Other:EUT with support laptop PC
Test By:Tom Chen

Horizontal 30 - 1000MHz

Marker No.	Test Frequency	Meter Reading	Detector	T130 8-14-12 (dB)	3m Loop (dB)	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Polarity
1	33.8769	41.12	PK	18.1	-27.5	31.72	40	-8.28	Horz
2	50.1599	54.15	PK	7.4	-27.3	34.25	40	-5.75	Horz
3	91.255	55.28	PK	7.9	-26.9	36.28	43.5	-7.22	Horz
4	97.8457	55.75	PK	9.6	-26.8	38.55	43.5	-4.95	Horz
5	338.9888	51.75	PK	14	-25.3	40.45	46	-5.55	Horz
6	362.8317	49	PK	14.8	-25.4	38.4	46	-7.6	Horz

Vertical 30 - 1000MHz

Marker No.	Test Frequency	Meter Reading	Detector	T130 8-14-12 (dB)	3m Loop (dB)	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Polarity
7	34.9151	39.72	QP	17.4	-27.5	29.62	40	-10.38	Vert
8	48.201	27.07	QP	8.2	-27.3	7.97	40	-32.03	Vert
9	82.966	53.87	QP	7.2	-27	34.07	40	-5.93	Vert
10	95.473	51.22	QP	8.9	-26.8	33.32	43.5	-10.18	Vert
11	340.97	23.59	QP	14	-25.3	12.29	46	-33.71	Vert
12	359.4594	53.31	QP	14.7	-25.4	42.61	46	-3.39	Vert

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

6 WORST EMISSIONS FOR 2.4G BAND

Project No:12U14745
Client Name:Apple Inc,.
Model/Device:B16 / 3x3 Base Station /2.4G
Test Volt/Freq:120 VAC/60 Hz, TX Worst Case
Test By:Tom Chen

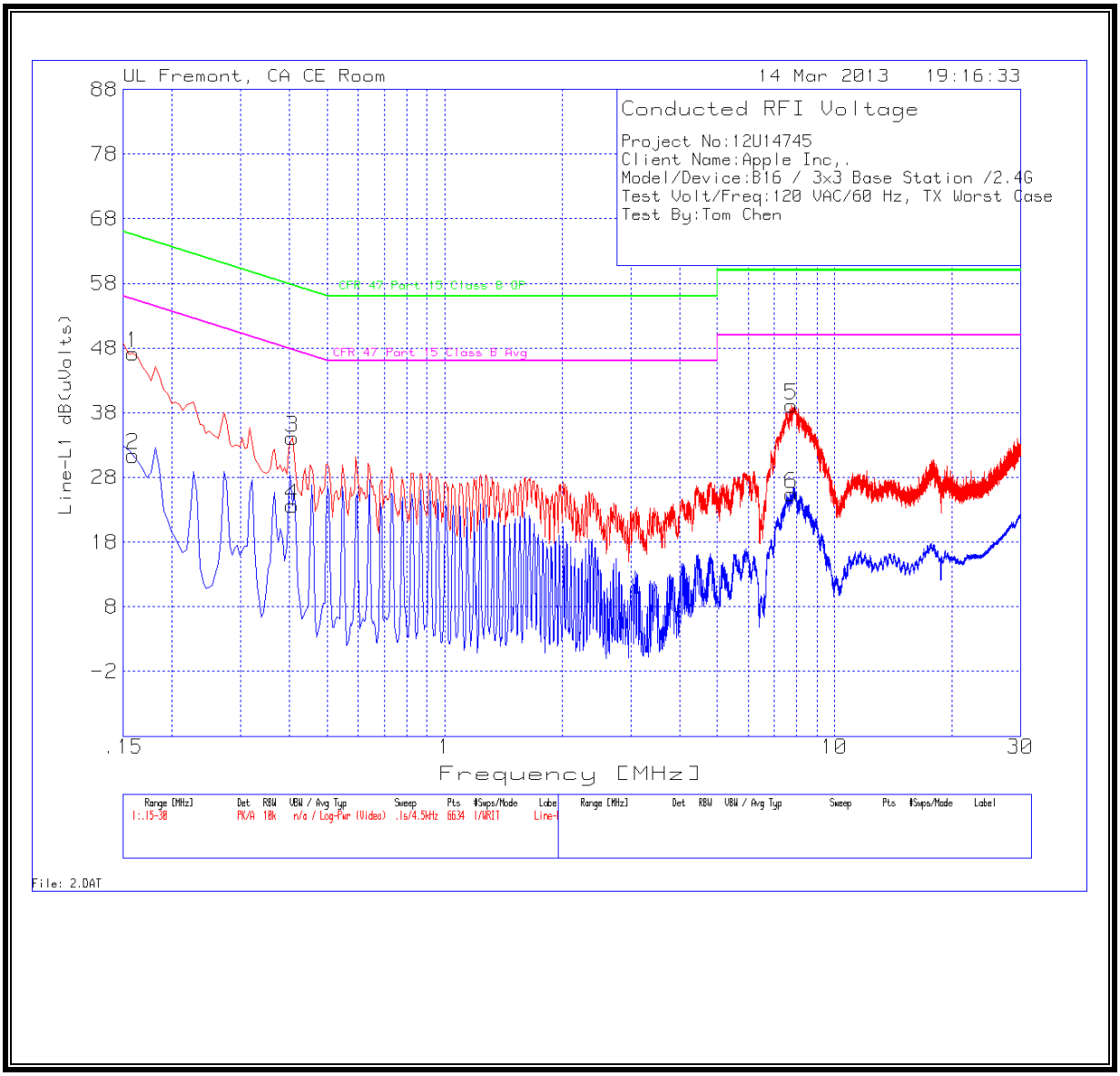
Line-L1 .15 - 30MHz

Marker No.	Test Frequency	Meter Reading	Detector	T24 IL L1.TXT	LC Cables 1&3.TXT	dB(uVolts)	CFR 47 Part 15 Class B QP	Margin	CFR 47 Part 15 Class B Avg	Margin
1	0.159	47.05	PK	0.1	0	47.15	65.5	-18.35	55.5	-8.35
2	0.159	31.3	Av	0.1	0	31.4	65.5	-34.1	55.5	-24.1
3	0.4065	33.99	PK	0.1	0	34.09	57.7	-23.61	47.7	-13.61
4	0.4065	23.56	Av	0.1	0	23.66	57.7	-34.04	47.7	-24.04
5	7.737	38.96	PK	0.1	0.1	39.16	60	-20.84	50	-10.84
6	7.737	25.19	Av	0.1	0.1	25.39	60	-34.61	50	-24.61

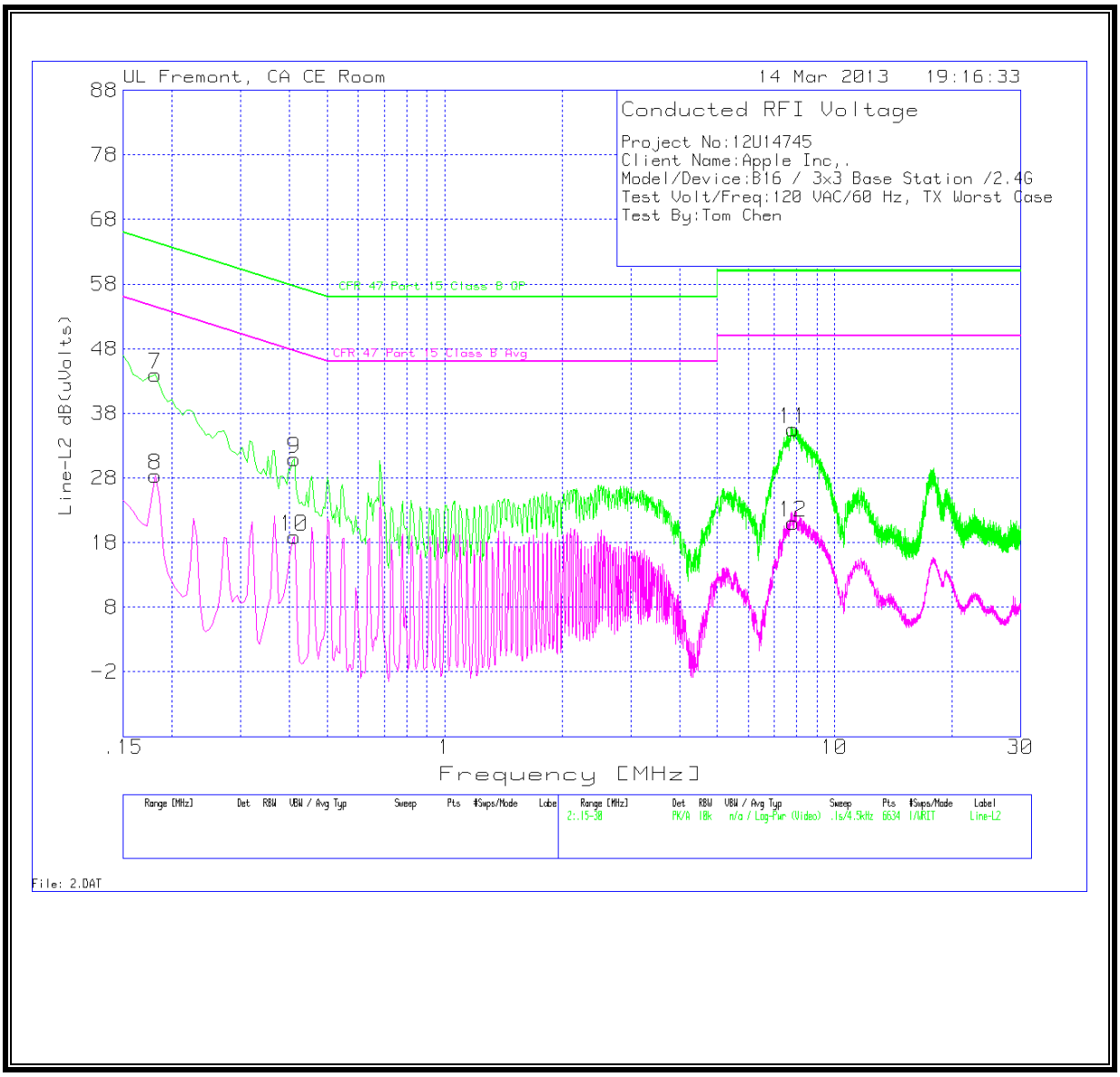
Line-L2 .15 - 30MHz

Marker No.	Test Frequency	Meter Reading	Detector	T24 IL L2.TXT	LC Cables 2&3.TXT	dB(uVolts)	CFR 47 Part 15 Class B QP	Margin	CFR 47 Part 15 Class B Avg	Margin
7	0.1815	43.86	PK	0.1	0	43.96	64.4	-20.44	54.4	-10.44
8	0.1815	28.33	Av	0.1	0	28.43	64.4	-35.97	54.4	-25.97
9	0.411	30.86	PK	0.1	0	30.96	57.6	-26.64	47.6	-16.64
10	0.411	18.85	Av	0.1	0	18.95	57.6	-38.65	47.6	-28.65
11	7.8225	35.33	PK	0.1	0.1	35.53	60	-24.47	50	-14.47
12	7.8225	20.93	Av	0.1	0.1	21.13	60	-38.87	50	-28.87

LINE 1 RESULTS



LINE 2 RESULTS



6 WORST EMISSIONS FOR 5.8G BAND

Project No:12U14745
Client Name:Apple Inc,.
Model/Device:B16 / 3x3 Base Station /5G
Test Volt/Freq:120 VAC/60 Hz, TX Worst Case
Test By:Tom Chen

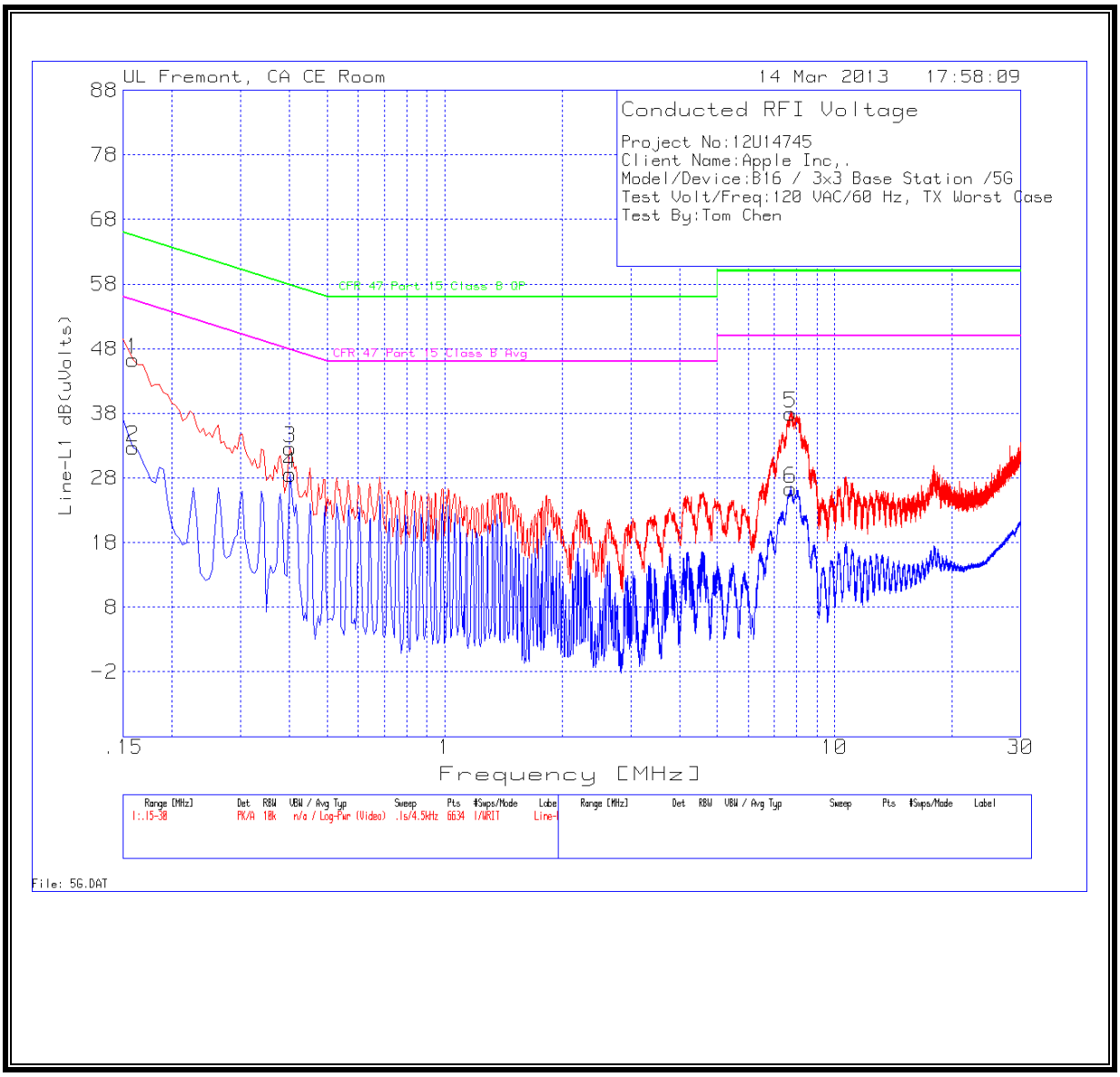
Line-L1 .15 - 30MHz

Marker No.	Test Frequency	Meter Reading	Detector	T24 IL L1.TXT	LC Cables 1&3.TXT	dB(uVolts)	CFR 47 Part 15 Class B QP	Margin	CFR 47 Part 15 Class B Avg	Margin
1	0.159	46.19	PK	0.1	0	46.29	65.5	-19.21	55.5	-9.21
2	0.159	32.67	Av	0.1	0	32.77	65.5	-32.73	55.5	-22.73
3	0.402	32.5	PK	0.1	0	32.6	57.8	-25.2	47.8	-15.2
4	0.402	28.48	Av	0.1	0	28.58	57.8	-29.22	47.8	-19.22
5	7.71	37.82	PK	0.1	0.1	38.02	60	-21.98	50	-11.98
6	7.71	26.15	Av	0.1	0.1	26.35	60	-33.65	50	-23.65

Line-L2 .15 - 30MHz

Marker No.	Test Frequency	Meter Reading	Detector	T24 IL L2.TXT	LC Cables 2&3.TXT	dB(uVolts)	CFR 47 Part 15 Class B QP	Margin	CFR 47 Part 15 Class B Avg	Margin
7	0.159	45.11	PK	0.1	0	45.21	65.5	-20.29	55.5	-10.29
8	0.159	24.45	Av	0.1	0	24.55	65.5	-40.95	55.5	-30.95
9	0.3795	30.14	PK	0.1	0	30.24	58.3	-28.06	48.3	-18.06
10	0.3795	19.04	Av	0.1	0	19.14	58.3	-39.16	48.3	-29.16
11	7.863	35.41	PK	0.1	0.1	35.61	60	-24.39	50	-14.39
12	7.863	22.68	Av	0.1	0.1	22.88	60	-37.12	50	-27.12

LINE 1 RESULTS



LINE 2 RESULTS